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Vol. 48
1928

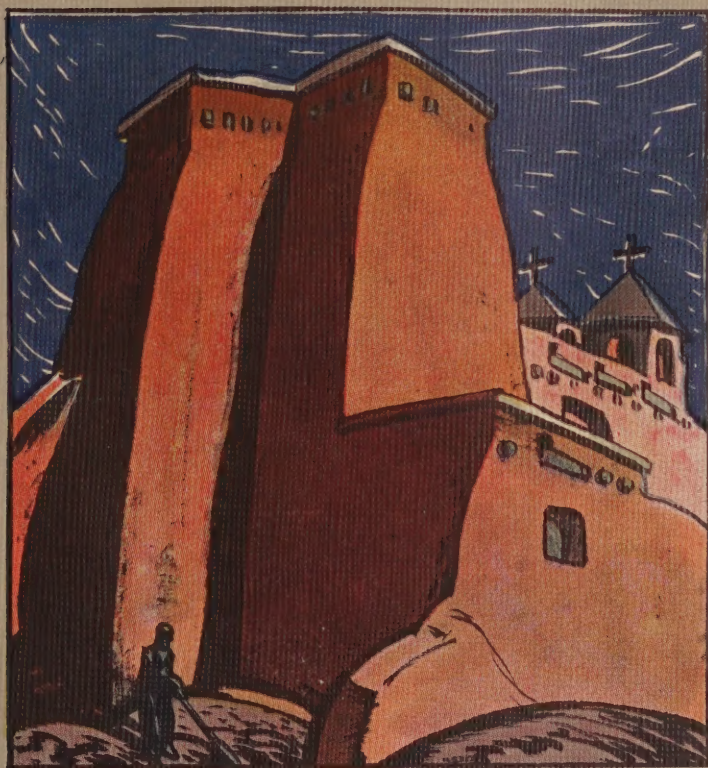


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Vol 48
1928

THE ARCHITECTURAL FORUM

IN TWO PARTS



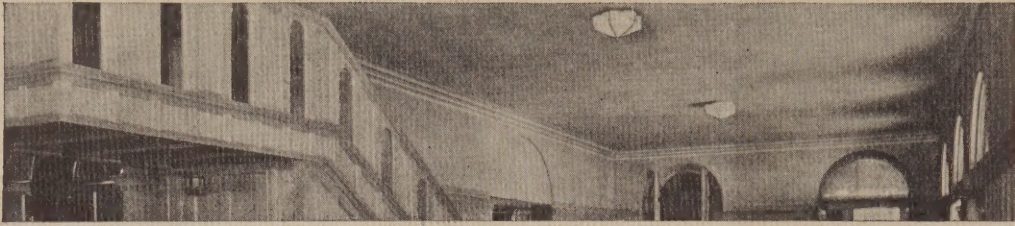
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ARCHITECTURAL DESIGN

JANUARY
1928

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Howard Myers, Pres.; James A. Rice, Vice-Pres.; Robert Sweet, Sec. and Treas.; Paul W. Hayes, Asst. Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, \$7.00. Canada, \$8.00. Foreign Countries in the Postal Union, \$9.00

Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat
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BOOK DEPARTMENT

SOME RECENT EXAMPLES OF DANISH ARCHITECTURE

THIS volume presents an illuminating survey of recent building achievement in Denmark, of both public and domestic character. There is a preface by Mr. Yerbury, short but directly to the point, and following this is an introduction by Aage Rafn, in which he succinctly sets forth the rationale of modern Danish practice and traces the immediate antecedents contributory to it.

The rest of the volume is made up of plates, of which there are 100. Twenty-eight of them are drawings, several perspective renderings being included among a larger proportion of plans; the other 72 plates are half-tone illustrations made from Mr. Yerbury's own photographs, all of which, as we should expect, are taken from a purely architectural point of view and hence really illustrate the subjects in a lucid and satisfying manner. Ecclesiastical, civil and domestic structures all receive a fair showing, and the geographical distribution is so arranged that the result may well be considered truly representative of the distinctly modern work. Besides making his photographs altogether adequate from the architectural point of view, Mr. Yerbury has managed to infuse into many of them a dramatic value, so that they convey with force the vibrant quality of the original subjects.

To not a few the book will probably be disappointing upon a first, cursory glance through its pages, because the majority of the buildings illustrated either go too far to meet with the approval of those who cherish the sanctions of long established convention and precedent, or else because they do not go far enough in their expression of modern design to satisfy the itching radicalism and anxiety for absolute originality which impel many exponents of the ultra-modern mode to cut loose from every link with the past. On second and closer examination, however, the conviction grows that the subject matter is of very real moment to all who feel any intelligent concern in architectural development, and that the contents comprise much of unquestionably enduring value. In his preface, Mr. Yerbury alludes to the "standards of logical construction and good taste" that almost universally prevail in the work of the Danish architects, and therein is to be found the key to most of the situation here set forth. Despite the occasional occurrence of features that may seem whimsical or fantastic, sanity and sobriety dominate most of the designs and cause a

feeling of reassurance for the future of Danish architecture along the channels in which, so far, it has been tending. Good sense has apparently precluded the awkwardness of that pitilessly rectangular and often brutally horizontal type of composition so frequently stressed by the exponents of the newer manner. In Denmark, at least, the adherents of the modern school do not regard

the element of grace as a weak and criminal futility; much of their work is quite reticent. While daring to think and to act with unfettered independence, they have not eschewed the forms found in the repertoire of the past but have often given them a fresh and original interpretation. From the point of complete novelty, the designs of the Church at Odense and of Grundtvigs Church, at Copenhagen, are the most striking, not to say startling, features illustrated. Certain of the extreme moderns are likely to talk a good deal about "purpose of expres-

sion" and get very touchy when their purpose is not understood. Just what may be the "purpose" of the flamboyant "frontispiece" of Grundtvigs Church, rising like the bristling crest of some Paleozoic sea monster, or what it may be intended to "express," it would be difficult to say off-hand. Nevertheless, it has commanding boldness and decision of character, and one is quite willing to accept it on trust, since it possesses grace along with strength. The Danish architects devote more than a little attention to rendering interesting and even distinguished structures of certain types which in America generally receive scant consideration. One could scarcely imagine a slaughter house designed in an American architect's office as being more than the bleakest and barest of utilities. What constitutes the Danish architect's idea is well illustrated here.

Many of the examples of domestic architecture illustrated have very genuine charm and, furthermore, they exhibit numerous characteristics that are thoroughly "cribbable." Doubtless, in due time, they will be "cribbed" and "adapted," and that, too, probably with commendable results! From start to finish, the book is stimulating, and Messrs. Fisker and Yerbury are to be congratulated on affording the public an admirable resume of what is now taking place architecturally in Denmark.

MODERN DANISH ARCHITECTURE: Edited by Kay Fisker and F. R. Yerbury, With an Introduction by Aage Rafn. Text and Plates, 8 1/2 x 11 ins. Price \$10. Charles Scribner's Sons, New York.



An Abbatoir at Elsinore, Denmark
Poul Holsoe, Architect

GEORGIAN DETAILS OF DOMESTIC ARCHITECTURE. By F. R. Yerbury. Text and 150 plates, 8½ x 11 ins. Price \$10. Houghton Mifflin Company, Boston and New York.

THE study of English domestic architecture during the reign of the four Georges, which lasted historically from 1714 to 1830, is of so much interest that surely no apology is necessary for the issue of this volume, comprising illustrations alone, of examples ranging over the whole of this period. The eighteenth century in Great Britain produced two styles in domestic architecture very much alike at a distance, essentially different in detail, one deriving from the composite genius of the whole age, the other directly traceable to Robert Adam. In both types, the Georgian and the Adam, two elements are consciously fused,—the basic British idea of a substantial and practical house, with large, comfortable rooms adapted for elaborate and stately entertaining, combined with an Italian overlay of adornment. Both types tend to be square, almost "chunky," structures, without noticeable roofs and laid out with conscious symmetry. While there are numerous exceptions, they are generally in red brick, with or without white trim.

The subjects chosen by Mr. Yerbury, a well known English architect, for this volume include some of the finest examples of Georgian domestic architecture, principally of the smaller type, although the author has thought it an advantage to include at the beginning of the book several illustrations of larger houses in town and country, and also of squares and streets in order to convey some idea of the setting and atmosphere of the period known as Georgian. Two striking examples may be seen in the illustrations of Bedford Square, and Bedford Place, London, which fortunately are sufficiently preserved to give a reasonably clear idea of the general character of the thoroughfares which the eighteenth century architects and builders designed. In this volume Mr. Yerbury has gathered illustrations from photographs of quite a number of Georgian buildings, facades, doorways, windows, ironwork, staircases and chimneypieces, of the kind which most interest American architects today. No part of England is richer in material of this character than London and the southern and southeastern portions of England, and the examples which are here presented are from London, Hampshire, Surrey, Bath, Hertfordshire, Berkshire and other southern counties. Their old villages and small towns have yielded many a photograph of manor house or a Georgian doorway of help as well as inspiration to the American architect.

Study of domestic architecture brings to light the popularity of the Georgian type of architecture in America, perhaps not true in every detail, but a type which is characteristically English. This strongly marked preference for English styles, instead of for French, Italian or Dutch adaptations, cannot be said to be the result of any historic or sentimental association of the types with American tradition; it is due wholly to the suitability of the styles to American life, conditions and customs. This quality of suitability includes much more than the dignity and grace which the type possesses; it includes the high degree of domestic comfort which it affords, and also an unusual flexibility as to scale and plan. The West End of London still retains a very considerable number of houses built at the time when this district was developed as a new residential area in Greater London, in

places such as Hampstead, Highgate, Kennington, Camberwell, and in almost every district within a radius of five miles of the city, are to be found neat terraces and detached villas erected in the late eighteenth and the early nineteenth century. Many have fallen into a distressing state of decay, and much of the fine exterior ironwork and many of the internal fittings have disappeared; but in other instances, particularly where the district has retained its prestige or increased its value as a residential area, obvious care has been taken to keep them in repair or to bring them back to their original condition. Among the illustrations in this volume, Mr. Yerbury has shown many interesting examples of Georgian doorways of which there are innumerable beautiful examples scattered over England, generally to be found in houses of the simplest appearance. Although there is a certain family resemblance in most of these doorways, seldom are two found quite alike; in small points of detail or in the ornament there is generally something that gives to each an individual charm. An interesting feature of this volume are the illustrations, 14 in all, showing some interior views of the governors' private suites at the Bank of England, and we see excellent examples of simple decorative art, and of the great ornamental value of the chimneypieces, showing the refinement and elegance of interior treatment of this period, possible in structures of a monumental sort, and here designed upon an admirable scale and with pleasing simplicity full of suggestion.

MANUAL FOR SMALL MUSEUMS. By Lawrence Vail Coleman. 31 plates, 395 pp. 6 x 9 ins. Price \$5. G. P. Putnam's Sons, 2 West 45th Street, New York.

THERE are certain subjects which, while of considerable importance, are likely to interest groups of people so small that little regarding them has ever been published in book form. One of them is the hospital, and another is the school house, though within the past few years the great importance of both has brought about the publication of a number of excellent manuals covering their organization, their operation and even more particularly the structures which house them and the equipment of one kind or another which renders their work effective. Much the same has now been done for the museum. Mr. Coleman is the Executive Secretary of the American Association of Museums, and his opportunities for observation and study have naturally been many and varied. Probably because the large museum is now well organized and established and its future reasonably secure, he covers in this volume only the small museum, which might be in a village, a town or a small city, or even part of an educational institution of one kind or another. He reviews in the most helpful way possible the organization of such a museum, its staff and operation, while of particular value to architects are the chapters dealing with the designing, planning and building of small museums, with their equipment and with the installing of exhibits. It is not always realized that all cities and towns and even villages everywhere, are establishing museums of one sort or another,—often they are primarily historical—and the illustrations which Mr. Coleman has been able to include in this useful volume are well calculated to afford suggestions to architects or museum directors who are concerned with the erection of such buildings anywhere in the country.

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AMERICAN APARTMENT HOUSES OF TODAY, CITY AND SUBURBAN. Illustrating Plans, Exteriors and Interiors. By R. W. Sexton. 316 x 9½ x 12½ ins. Price \$16. Architectural Book Publishing Co., 31 East 12th Street, New York.

TO those of us who remember the first halting steps taken toward improvement in apartment house building, some 20 years ago, the present status of the apartment house is nothing less than amazing. During the last two decades we have made some striking advances in public and commercial buildings, but the improvement made in apartment structures is far more radical, and its results are more notable. When we think of the beautiful apartment houses we see or read of, there can be nothing but congratulation on what has been done in this field during the last few decades. The most perplexing problem for architects had to do with introducing into the apartment house the atmosphere of a home. In one early instance the architect introduced duplex and simplex apartments alternately throughout a building, thereby increasing or decreasing the heights of the ceilings.

It has now been many years since coöperative ownership of a residence structure was first attempted in America, one of the earliest ventures being the so-called "Spanish Flats" in New York, now about to be demolished. Because the methods by which success in such a field was to be attained were not sufficiently understood, the early projects met with difficulty, if not with disaster. But the matter was given the careful study of minds well trained by dealing with other problems more or less similar, and with full and complete understanding of the problem there have been worked out means or methods which years ago definitely assured success to those who would profit by the lessons which experience has taught to those who would learn. This understanding covers, too, the general subject of planning, which involves, of course, securing the utmost in the way of accommodations within the minimum of area, and there is covered also the planning of rooms in their relation to one another. This includes so planning as to secure the best exposures, adequate light, and the best arrangement of the proportions of building plots which, according to varying municipal laws, may be occupied by buildings.

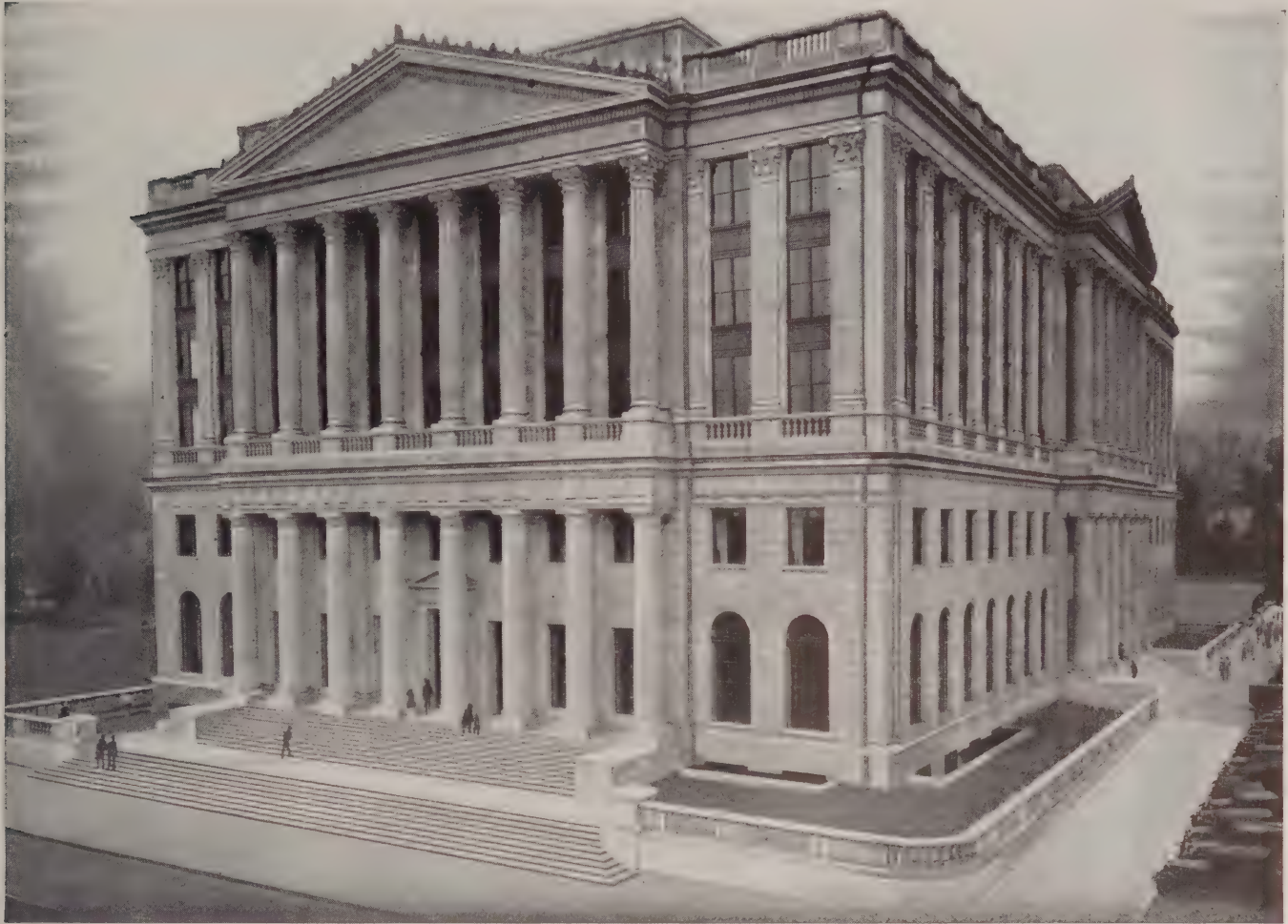
The success of an apartment house depends almost wholly on its plan. In later years, the old type of apartments, with their great number of dark rooms, their small and poorly ventilated bedrooms, and their small, inadequate kitchens, has disappeared. The apartment house necessarily enjoys from municipal governments a certain amount of official supervision, as to cleanliness, overcrowding, safety from fire, and proper construction, which in a far less degree is given to private dwellings.

Two factors which have been most ignored in the erection of apartment houses are sun exposure and wind exposure. It is obvious that a court open to the southeast or south is to be preferred to a court with north or northwest exposure. A southern court will get the cool breezes in the summer and is protected from cold winter winds. From the viewpoint of light, the southern exposure has much greater value than a court exposed to the north. In addition to the greater amount of light obtained, the effect of sunlight as a destroyer of germs must be considered as having great hygienic value. In fact the entire difficulty of planning good apartments is due to the question of light and air, and the New York

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tenement house law has made this very much more difficult than it might otherwise be. It has at times legalized poor plans and prevented making good plans. The apportioning of the floor space is based on the same principles that govern the planning of a private house. On account of the city's rapid growth, and its peculiar geographical form, the housing problem in New York is much more difficult of solution than in most localities. This problem has been solved to a certain extent by apartment houses, which have played an important part in the city's life the last 35 or 40 years. Apartment houses are occupied by skilled workers, by people who earn fairly good incomes, by the middle class, the well-to-do, and also by the very rich, and indeed by all classes.

In this volume, Mr. Sexton gives a short account of the development of the apartment house, together with a review of the success it has made, economically and as regards convenience of plan and equipment. Coöperative ownership, which has recently attained such marked popularity, consists, as its name implies, of ownership by those who occupy the apartments. Both the land and the building are owned jointly by the tenants. On account of the enormous variety in apartments, it would be impossible in one work to consider them all, so the volume deals with the better classes of the latter-day apartment house, built within the last 15 years, and points out its defects, its disadvantages and its good points, and calls attention to good and bad methods of planning, not from the architect's point of view, but considering the laws of hygiene, of household economy, and proper housekeeping, and in fact its general desirability as a dwelling place.

THE SMALLER HOUSE OF TODAY. By Gordon Allen, F. R. I. B. A. 179 pages, 5½ x 8¾ ins. Price \$3.75. Charles Scribner's Sons, 597 Fifth Avenue, New York.

STUDENTS of what is now known as "small house" architecture find interest and often profit in keeping abreast of developments in the small house architecture of other countries, particularly of England, where conditions are sufficiently akin to those prevailing in America to give to English work a highly practical value. That these possibilities are by no means either ignored or overlooked might be proved by explaining the rapid rise to public favor of what is called the "Modern English" style of domestic architecture, and some of the most successful examples of the use of the style are not in England, but in America, in parts of the country widely apart.

In this volume a well known English architect presents the English version of the small house, which apparently is as popular in Great Britain as in the United States. The work abounds in suggestions, afforded not only by illustrations of exteriors and interiors, plans, and data of other kinds, but also by the text pages, divided into ten chapters dealing with various matters connected with small house design and construction. A few of these chapters discuss these details in terms so distinctly English that they have no very definite bearing upon house building in America, but the teachings of the volume as a whole are so helpful and comprehensive that the work deserves a wide circulation among American architects, builders, and home owners, to whom it will doubtless bring a heightened appreciation of this important domestic architectural type for use in an adapted form.

"CHURCH BUILDING"—By *Ralph Adams Cram* (A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.



THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added,

which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of churches and their worship.

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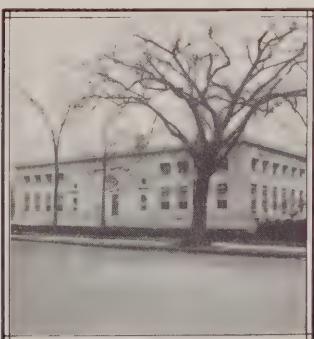
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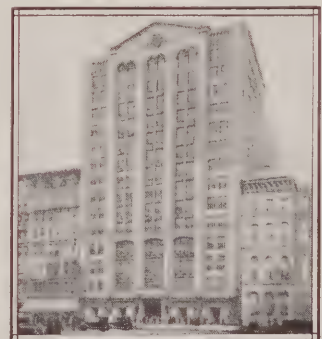
Columbia GUARANTEED WINDOW SHADES
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THE EDITOR'S FORUM

PRIX DE ROME

THE American Academy in Rome issues the program for its annual competition for fellowships in architecture, painting, and sculpture. In architecture the Katherine Edwards Gordon Fellowship is to be awarded, as well as a fellowship recently endowed by the late George B. Gordon, and Mrs. Gordon, of Pittsburgh, in memory of their daughter. In painting, the fellowship is provided by the Jacob H. Lazarus Fund of the Metropolitan Museum of Art, established by Mrs. Amelia B. Lazarus and Miss Emilie Lazarus. The fellowship in sculpture is supported by the Parrish Art Museum Fund, given by Samuel L. Parrish. The Grand Central Art Galleries of New York will present free membership in the galleries to the painter and sculptor who win the Rome Prize of the Academy and fulfill the obligations of the fellowships.

The competitions are open to unmarried men, not over 30 years of age, who are citizens of the United States. Fortunately, the Academy has been able to increase the stipends to \$1,500 a year, and also to grant an allowance of \$500 for travel, in addition to the present annual allowance of from \$50 to \$100 for material and model hire. Residence and studio are provided free of charge at the Academy, and the total estimated value of each fellowship is about \$2,500. In architecture, graduates of accredited schools will be required to have had architectural office experience of six months, and men who are not graduates of such schools may enter the competition if they have had at least four years of architectural office experience and are highly recommended by fellows of the American Institute of Architects. Entries for all competitions will be received until March 1, 1928. Circulars of information and application blanks may be had by addressing Roscoe Guernsey, Executive Secretary of the Academy in Rome, at 101 Park Avenue, New York.

STEEDMAN FELLOWSHIP

THE governing committee of the James Harrison Steedman Memorial Fellowship in Architecture announces the third competition for this fellowship, to be held in the spring of 1928. The value of the fellowship is represented by an annual award of \$1,500 to assist well qualified architectural graduates to benefit by a year in travel and the study of architecture in foreign countries, as determined by the committee and under the guidance and control of the School of Architecture of Washington University. The fellowship is open on equal terms to all graduates in architecture of recognized architectural schools of the United States. Such candi-

dates, who shall be American citizens, shall have had at least one year of practical work in the office of an architect practicing in St. Louis, and shall be between 21 and 31 years of age, at the time of appointment. Application blanks for registration can be obtained at any time upon written request addressed to the head of the School of Architecture of Washington University, St. Louis, to whom all candidates desiring to enter the competition are required to forward their application blanks not later than January 19.

NEW ARCHITECTURAL CLUB

ONE of the more recently organized associations of architects, draftsmen and others interested in architecture is the Pasadena Architectural Club, formed tentatively in June, 1927, and now duly organized upon a permanent basis. The officers are William J. Stone, President; Orrin F. Stone, Vice-president; William J. Byers, Secretary.

WAR MEMORIAL IN BELGIUM

AMERICAN engineers are raising a fund to make possible the installing of a clock and carillon in the tower of the library of the University of Louvain in memory of the American engineers who died in the World War. The fund is being sponsored by the Committee on War Memorial to American Engineers, of which the chairman is Dr. Edward Dean Adams. A group of engineers went lately to Princeton to inspect and hear such a carillon.

Serving with Dr. Adams on the committee are representatives of the engineers' associations. They are George W. Fuller for the American Society of Civil Engineers; Arthur S. Dwight for the American Institute of Mining and Metallurgical Engineers; A. W. Berresford for the American Institute of Electrical Engineers; Charles M. Schwab for the American Society of Mechanical Engineers; George Gibbs for the United Engineering Society.

COMPETITION IN DESIGN

TO stimulate the creative ability of American designers in the field of wallpaper, the Art Alliance of America, 65 East 56th Street, New York, announces a wallpaper design competition for these prizes offered by the Thomas Strahan Company: First Prize, \$400; Second Prize, \$200; Third Prize, \$150; Fourth Prize, \$100; Three of \$50 each.

Designs will be received at the Art Alliance from February 12 to February 14, 1928. The jury of award is made up of well known authorities on design: Miss Nancy McClelland; J. G. Hopkins; Richard Thibaut; Richard F. Bach; John Alonzo Williams; Richardson Wright; and Alon Bement.

They moved in May



*... by Christmas
they were crowded*

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THE EDITOR'S ANNOUNCEMENT

THE triangle is now more than ever the symbol of architecture, with Design as its base, joined on the one side by Engineering, and on the other by Business. The architect realizes that his progress depends on the strength and breadth of his knowledge and ability in each of these three major divisions of his profession. The basic forces which are giving their impress to every form of business and professional activity are similarly influencing architecture. In the case of the architect, economic pressure, new standards of living, progress in the science of building, new materials and equipment are among the things which have increased his responsibility and complicated his problems. To meet these changing conditions THE ARCHITECTURAL FORUM enlarges its editorial scope and adopts a new format to parallel the work and interests of the architect so as to render to him as complete a service as he must render to his client.

In order that the increased content of THE ARCHITECTURAL FORUM shall be most convenient for reading and reference, a natural physical division of the magazine has been made. One part is devoted to architectural design, its enlarged content selected for architects by architects for its practical and inspirational value. The other part of THE ARCHITECTURAL FORUM is devoted in its entirety to engineering and business subjects, authoritatively and adequately treated. As a further service the advertising has been carefully classified so that all products which are essentially of interest because of their design character are found in the Design Section, while those products which are primarily of an engineering or structural character are placed in the Engineering and Business Section thus facilitating the architect's use of this important feature of the magazine. As heretofore, THE ARCHITECTURAL FORUM will appear as a monthly.

It is hoped that the additions which have been made to THE FORUM as well as the changes in its physical character will increase the value of this journal to the profession. Whatever measure of recognition it has achieved in the past has reflected the generous and helpful interest of architects. By making available the work of their offices and by suggesting subject matter and improvements, they have lightened the burden of the editorial staff in its effort to produce an architectural magazine service which would completely satisfy the needs and aspirations of the profession. It is hoped that the new FORUM will prompt a continuation of this interest in ever-increasing measure.

Parkinson Hooper



STUDY FOR A FRESCO DECORATION SYMBOLIZING
ELECTRICAL COMMUNICATION THROUGH WATER, EARTH AND AIR,
FOR THE TELEPHONE BUILDING, NEWARK

From a Water Color by J. Franklin Whitman, Jr.

Voorhees, Gmelin & Walker, Architects

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER ONE

JANUARY 1928



A NEW ARCHITECTURE

BY

RALPH T. WALKER

VOORHEES, GMELIN & WALKER, ARCHITECTS

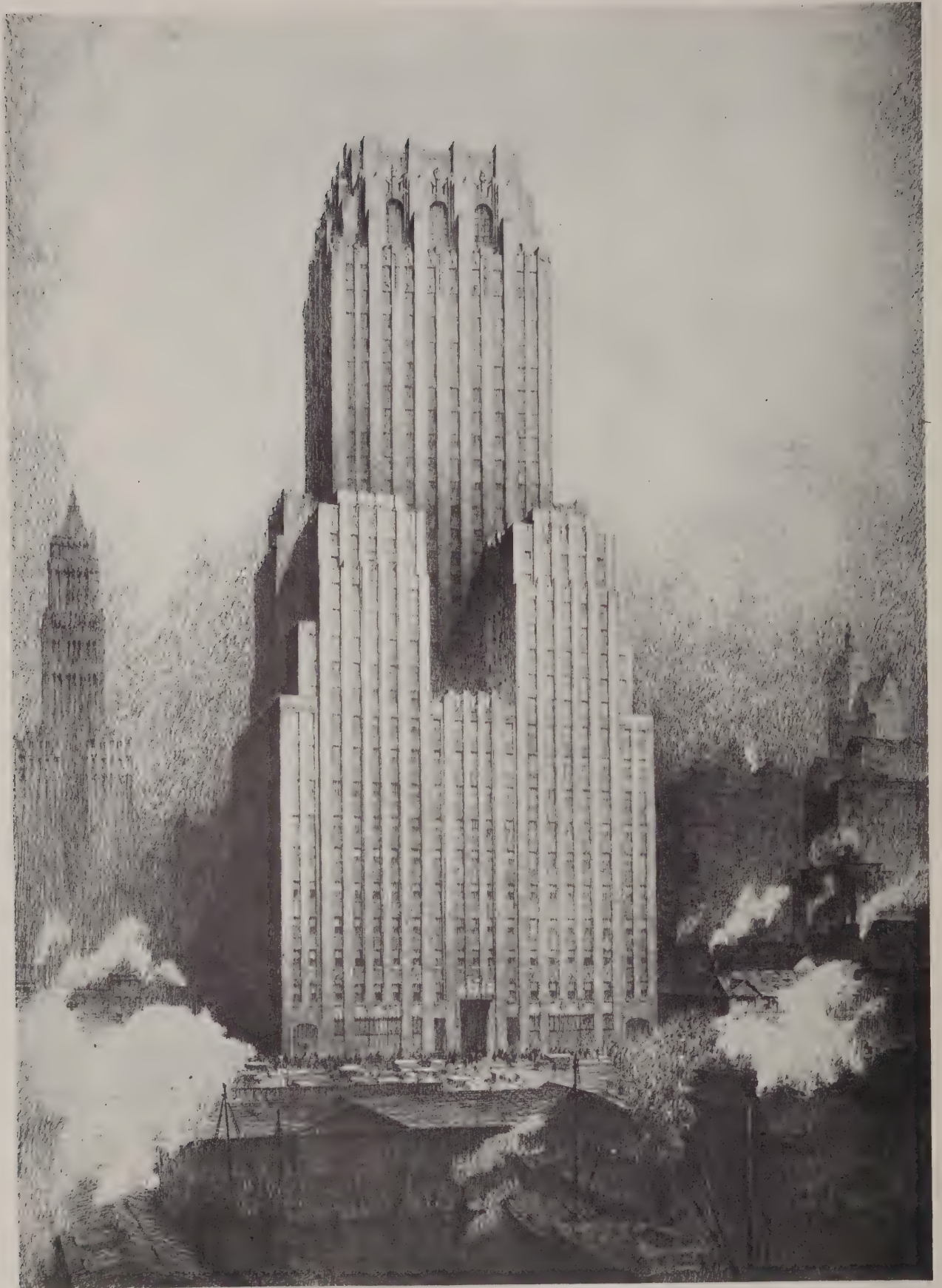
IT seems to me that we have come to a bend in the road, a place in which to pause, where we can look backward over the past and see its contributions and at the same time look forward over the future and glimpse its possibilities. We realize that behind us are the known and the secure, and that before us are the unknown and adventure. To the rear is the broad road of imitation, which we have traveled; ahead is the narrow way of creation, which is yet to be explored. We shall take into the future, however, a part of the past and a part of the present, even though these parts be but remembrance; this is true of architecture which grows out of the physical and spiritual needs of humanity, and while these needs change, they never are completely overthrown but rather are the new needs woven into the woof of the older. This being so, it would seem that the architectural expression of these needs, while taking on new aspects, will continue to retain much of that which is of the past and of today. In fact, it is the tying in of one need-expression to another that makes for a universal quality without which no art lives; for without universal aspect, art is but a fad,—poster-like in conception, here today and gone tomorrow. Though art may change, it must be enduring.

Architecture is neither the structure nor the skin that forms the covering, but is a balance between them and the requirements of man. It should follow, then, that true architecture can never be entirely new but becomes, if creative, something akin to a series of fresh viewpoints through which the individuality of the designer and the times in which he lives are expressed. At the convention of the American Institute of Architects, last spring, a day was devoted to the discussion of collaboration. Among those who spoke, the craftsman was the only man who urged the necessity of leaving behind something of himself and of his time; something not imitative but creative. The change that is coming into our architecture is coming through that desire for creation, with a full realization of the changing needs of man, and not in a mere desire for bizarre change. Creation presupposes that there is a sufficient knowledge of the inherent nature of the architectural need,

—the ways and means to create from within rather than from without, whereas imitation is wholly external in its quality. In the past architecture has been limited by a lack of scientific structural knowledge, and our entire sense of proportion has been built upon that lack. The possible span of the lintel and the arch has so formed our conceptions of what is pleasing to the eye that in the use of such materials as steel and concrete both the structure and the skin have been imitative of units that conform to traditional forms. And, strange as it may seem, it is almost as difficult to rid the engineer as it is the architect of these ideas. It is easy to think of structure in design as being of larger moment than it actually is, whereas it should be thought of as having but this one function,—to span the space desired and to span it economically, whether beautifully or not.

For the first time in the history of architecture we have at our disposal means and methods of building that are unlimited in their possibilities. Our ways of construction are the most flexible in the long struggle to span space, and new forms are coming into existence that are strange to our sense of fitness, although they gradually become part of it. It can be questioned, however, whether beauty is ever synonymous with economy of construction. Certainly most of the so-called modern European architecture, although extremely economical, is far from pleasing in appearance. It seems to me a fallacy that anything resolved into absolute efficiency must necessarily be in the same degree beautiful. Therefore, while the desire to be economical in structure is laudable, it is not by any means the end of the story that the French architects, such as Ferrier and LeCorbusier, think it is.

The fundamental, spiritual and intellectual needs of man can never be satisfied with the thin, austere design of the engineer-architect, which, while perfectly honest, fails to take into consideration the thoughts or emotions of anyone other than a "Robot." We are beginning to understand scientifically that which was probably intuitive during the great periods of architecture,—that while it is necessary to securely enclose the body, every effort should be made to keep the mind and spirit unenclosed,—in other



NEW YORK TELEPHONE BUILDING
VOORHEES, GMELIN & WALKER, ARCHITECTS



NEW JERSEY BELL TELEPHONE BUILDING, NEWARK
VOORHEES, GMEIN & WALKER, ARCHITECTS

words, to create horizons beyond the immediate walls. In looking forward to a new architecture, the ideas of the use of materials that have held in the past will be slowly discarded, and new materials or uses will come into effect. Concrete, which at present is actually a dull mass of mud, will have, with a more intelligent use of forms and of the material itself, an unusual amount of pattern and variety of color besides its economy to recommend it. Cast stone, which at present is imitative of natural stone, will have character and beauty that are by nature parts of itself. Synthetic materials, because of ease in manufacture, will take a much larger part in our design, but they will be developed and used for their inherent qualities, which will grow in importance.

It seems to me that another fallacy which holds of this day is that the use of the machine tool means standardization and utter, stark simplicity, whereas the reverse is actually true; the machine means diversity, and complexity, which is, after all, the spirit of our times. The standardized mass production of today will not be of necessity the standard of tomorrow. In fact, our talk of standards is brought about because of the difficulty that comes in main-

taining them. Americans are spoken of as the most mechanical group of people in the world, yet nowhere is individuality in architecture, or lack of what is known as a "school," more in evidence than in this country. Our cities and home developments are chaotic at present because of their great diversity,—in other words, the regularity we know as mechanistic is of the tool only and not really of its product.

The new architecture will not be a thing of slab-sided cubes or spheres, built up of plane and solid geometry in which there is no element of time (something absolutely lacking in either primary forms or colors), but will have an infinite variety of complex form and an intricate meaning that will be comprehensible to minds that are able to project thought beyond infinity. Otherwise we might well be in a position similar to that of the pessimistic Basque who had inscribed over his door these words: "The past has deceived me; the present harasses me; the future horrifies me." The present is a time of change in every sphere of life, and architecture as a living art must change with the times. But the changes will be worked out in accord with rules governing all arts.



Syracuse Telephone Building
Voorhees, Gmelin & Walker, Architects

OFFICE BUILDINGS OF TODAY AND TOMORROW

EDITOR'S NOTE. This article is based on conversations with several leading architects who specialize in commercial architecture

THE point has been reached in the development of American architecture where many of our buildings are stark expressions of practical commercial requirements in terms of modern construction; piles of simple, rectangular forms like stacks of cardboard boxes of varying sizes; while our monumental buildings are architecturally admirable, elaborate and costly pieces of scenery, their classic orders and their Gothic arches are just so much false construction in stone, hung on steel framework. In the case of the former, buildings which must earn the maximum profit on the investments, the architect has been compelled to abandon all pretense; nothing is permitted to be spent upon the simulation of old masonry construction. The building is a shell, and a shell it must appear. So far, little has been done to give it beauty. If the architect is able to secure effective massing and good proportion in the necessary parts of the building, no one is likely to object, and the good appearance of the structure enhances its value. Here and there we see attempts to enrich a building of this kind in a consistent manner, and the result is usually the application of a "linoleum pattern" to the wall surfaces forming the spandrels between windows of the various stories.

Between these two classes of buildings, those in which utility and profit are the governing conditions on the one hand and such monumental structures as large public libraries and museums, churches and great railway terminals on the other hand, lies a third class of structures, including great office buildings, important hotels, etc. It is in the designing of buildings of this type that the greatest possibilities are open to the architect. He is neither hampered by being held to the most rigid economy nor obliged to mask modern construction with ancient forms. Usually these buildings

are tall. They can be seen at great distances, often for miles, and the silhouette is consequently important. That this fact is recognized is shown by the more careful study architects have been giving lately to the silhouette. In addition to securing good composition in the handling of the stepped masses of these buildings, which have the setbacks required by the zoning laws, the architect is permitted usually to elaborate the highest portion. This he does, most often by giving it the form of a tower of characteristic shape which distinguishes the building as far as it can be seen. So right here we have a new form of building, a new style of architectural expression developed from conditions peculiar to our own times. That it may bear the ornamental detail of one or another historic period need not concern us greatly at this time, so long as this ornament is intelligently used, as in a great many instances it is.

A salutary influence of incalculable value in the sound development of modern architectural design

is the compulsory study of mass and proportion brought about by the necessity for depending upon these elements for most of the character in present-day tall buildings. It makes the architect look beyond the familiar facade detail and see something larger and simpler. It makes a good basis, this mastery of mass and silhouette, for the development of a characteristic enrichment which may be expected to appear in the course of time. A condition that is doing more than any other one thing to force architecture out of the rut of stylistic precedent is the comparative thinness of the walls of steel frame buildings. With thin walls there are of course no deep reveals. The traditional styles, having been developed in heavy masonry construction, consequently, are not adaptable to modern steel frame buildings. This obliges the present-



Photos. Sigurd Fischer

The Arsenal Building, New York
Buchman & Kahn, Architects



Building at 550 Seventh Avenue, New York
Buchman & Kahn, Architects

day architect to seek other means of expression. Among these means are polychrome ornament, sculpture in low relief, and use of materials of interesting texture and coloring, and all these means are in use.

As has already been said, these buildings can be seen from great distances, but it is also true that they cannot be seen in their entirety when one is at all close to them, which is another modern condition that is having its influence. A Greek temple, a Roman arch, a Gothic cathedral or an Italian palace could be seen in its entirety from a comparatively short distance. Usually there was an open space in front of it, or all about it. Our buildings are on narrow streets; we see them either as towers blocks or miles away, or as rows of shop fronts within a few feet. Consequently, there is no place for fine ornamental detail such as is found in the architectural work of the past. On the lower parts of our buildings one cannot enjoy the decoration because of the jostling crowds on the sidewalks, and higher up it is lost in the distance. Furthermore, on our canyon-like streets the lower stories need to be mostly of glass to admit light and protect window displays. The high percentage of glass area, not only in the lower stories, but throughout, is one of the important elements in modern architectural design. Steel is the greatest factor of all, for it is from the use of this material that most of the conditions touched upon here arise. Without steel we would not have tall buildings with thin walls and large areas of glass, any more than the people of classic times or the Renaissance or the eighteenth century had them. So this material,—steel,—has given us an entirely new basis for architectural design, and we have only begun to adjust ourselves to it. For the massiveness of masonry there has been substituted the lightness of a strong, slender framework which we enclose with the thinnest possible shell of brick, stone or terra cotta. To this we endeavor to apply our masonry traditions as well as we can, while we are becoming acquainted, in an artistic sense, with this new element in the field of architecture,—steel.

We have traveled a long way since the St. Paul Building, still standing at Broadway and Ann Street, was built some 30 or 40 years ago, its surface loaded with superimposed orders. Then came the idea that a skyscraper should be designed in the likeness of a column, with a base of lower stories treated with columns, a shaft of plain walls pierced with windows, with a cap consisting of the upper stories treated with columns or pilasters and surmounted by a massive cornice. That was an improvement, for it gave a better composition. Then after a considerable time came the Woolworth Building, with its emphasis upon verticality. More recently came the concept of the building as a pile of boxes, which is closer to the truth. We have finally stripped the thing down to its structural and practical elements, and have begun to develop designs from that basis,—a sound and logical method. In doing this, most architects are drawing upon the detail of the historic

styles for their decoration and ornamentation, while a few are endeavoring to create detail of a consistent character, original in conception and suitable in scale. It is interesting to note the variety in the method of treatment adopted by the architects of some of the important buildings recently erected or now under construction in New York. The building for the New York Life Insurance Company, Cass Gilbert, architect, which is now well advanced on the site of the old Madison Square Garden, is essentially modern but conservative in its design. The detail of historic character is skillfully incorporated in a building that meets present-day requirements. The Savoy-Plaza, McKim, Mead & White, architects, at Fifth Avenue and 59th Street, also reflects the architecture of the past in a skillful adaptation of an entirely different style. The Sherry-Netherland on Fifth Avenue, one block north of the Savoy-Plaza, Schultze & Weaver, architects, is still different, but in line with architectural precedent so far as form and detail are concerned. Still another building of traditional detail and modern massing, is the new Aeolian Building at Fifth Avenue and 54th Street, Warren & Wetmore, architects. All of these structures are notable.

A splendid example of a thoroughly modern commercial structure is the Park Avenue Building at Park Avenue and 32nd Street, Buchman & Kahn, architects. It consists of huge, simple, square-topped masses, stepped back and admirably proportioned. Its severity is relieved by the emphasis of vertical members and by the use of polychrome terra cotta in simple designs. Further relief is provided by the texture effect of brickwork laid in patterns in the spandrels and elsewhere to produce the desired areas of tone. The Park Avenue Building is a notable example of the new, the simpler, and the better method in the handling of the setbacks. Until quite recently there was a prevalent tendency to make the setbacks in such a way that the effect was scattered and restless because of the too great number of small masses. Our architects have chosen to solve their problems in a straightforward way, either using historic ornament or, as in the case of the Park Avenue Building, the simplest decoration, designed to harmonize with the structure. The tendency, prevalent in Europe, to invent unusual forms, often apparently for the sake of variety, has not yet appeared in this country. As a result, the work of our architects has commendable soundness. To American eyes, at least, most of the forms created by European architects of the present day are meaningless and ugly; they seem to have no good reason for being. So it seems much better to produce such admirable buildings as those already mentioned here, making proper and intelligent use of historic ornament, whether Aztec, Assyrian or Byzantine, or of the simplest of modern forms, rather than to strive for startling and bizarre originality. It is better taste and also better art.

Our architects have gone their own way, paying little attention to the modernist movement in Europe, though they have been cognizant of it from its in-



Office Building, 49th Street and Madison Avenue, New York
Buchman & Kahn, Architects

ception 30 years or more ago. Since the Exhibition of Modern Decorative Art held in Paris in 1925, Americans, both in the architectural profession and laymen, have shown a considerable degree of interest in contemporary European work. Undoubtedly, this interest has had an appreciable influence on American architecture of the present day, but this development has been both logical and natural through the meeting of conditions, rather than because of any direct outside influence. European designs are helpful principally as a stimulant rather than as a source of inspiration, for they are not usually assimilable. This may be because they are too essentially European, but it is more likely that it is because they are too strongly marked by individual mannerisms.

"Simplicity and honesty, in an attempt to express the particular problem in the most direct way, are prime essentials in modern architectural design," according to Ely Jacques Kahn, of Buchman & Kahn, architects of the Park Avenue Building and of other unusually interesting modern buildings. "This expression should be without any particular label," continues Mr. Kahn. "It should not simulate, for instance, a Renaissance palace or a Gothic cathedral, but simply be the outgrowth of the conditions, including the purpose of the building, the nature and location of the site, and the materials and methods of construction. One danger is in the tendency of people to assume that modern design is something that in itself must have a label. It is really only a matter of direct procedure without regard for conventions or precedent, when the latter happen to be wrong or not applicable. The purpose of the building is the first thing to consider,—structures for certain purposes must meet those purposes, and the design must be economically sound; it must lend itself to renting to advantage, for instance. A modern building should be essentially a piece of good engineering. Beauty is something that may come through the mathematical solution. This is the reverse of the theory upon which architects have been accustomed to proceed, for it means getting away from the idea that the building should belong, first of all, to some historic period or style,—that it need be Gothic or Renaissance, for instance. Starting with the selection of a style is the wrong way. It seems to me that the practical problem should be the source of the design. If one first gets beautiful massing, the detail is a secondary matter, and it will have a certain beauty if it is an honest thing. Of course a structure like the Park Avenue Building is purely a matter of construction with the great masses broken by line and color in a pleasing way. The main difference between the architectural detail of such a building and that of a structure of the traditional type is that this ornament is an integral part of the building, while in the other type it is something that is applied and may be removed without destroying the fabric. In this building the color is a definite part of the concept; the mass is considered as a whole and broken up with areas of color of sizes and shapes believed to be

suitable to the scale of the building. This detail is derived from the surface of the material of the building; it consists entirely of pieces of the material in different colors, producing shadows or holes by their projection or by their being recessed. This is just the reverse of the usual method, which consists in deriving ornament from some other source and translating it into the material, as flowers for instance rendered into bronze or marble. This method is more like cutting into a block of clay and letting the cuts make the surface interesting; it is modeling the building itself, not adding extraneous decoration to it. Color has been used on this structure in place of carving. At a great height the effect of fine carving would be lost, but simple areas of plain color or tone of suitable size are effective at a distance."

Modern buildings are seen under conditions different from those affecting buildings of other times; they are surrounded by a conglomerate mass of structures and need to be simple and strong in design to offset this confusion and to have proper dignity. The materials we use for the outer surfaces of our buildings, while not perfect, will probably not be displaced by any other materials in the near future. For this purpose, which is to form the enclosing shell of a building, a flexible material is needed. Brick, terra cotta and stone answer this requirement; they are supplied in blocks that are small enough to be handled easily. Some kind of burnt clay is the best surface material for building, since it is fire-resisting. Metal is not suitable because it expands and contracts with changes of temperature. There has been much in the newspapers about proposed buildings entirely of glass and steel, but glass used in this way is unsuitable because of the great loss of heat and because of trouble from condensation on its surface. Also, those who propose buildings entirely enclosed in glass evidently forget the need for walls in which the necessary pipes of various kinds could be enclosed.

Several of the younger modern French architects have attempted to design tall commercial buildings in which heavy glass blocks are to replace brick and terra cotta as the material for the exterior walls. It might be an interesting experiment to try for once enclosing the sides of a tall building with glass blocks, the resulting effect of which would undoubtedly be bizarre and startling. The steel framework of the building would naturally show through the glass blocks, and the effect as a whole would be as bare and naked as a bleached skeleton hanging in a doctor's closet. Because the bone and sinew of the modern skyscraper are its steel frame, it is neither artistic nor advisable to leave its joists and columns exposed on the outer walls. The "skin" of a building, although constructed of masonry, should be as flat and thin as possible, and should express color and texture, as in a fabric or textile. In the endeavor to originate and create a style of architectural decoration sufficiently flat in feeling but brilliant in design, a distinctly new type of ornamentation is being created by several of the leading younger American architects.



Photos. Sigurd Fischer

NEW YORK FURNITURE EXCHANGE BUILDING
BUCHMAN & KAHN, ARCHITECTS



See Illustration on Page 6

DETAIL, ORNAMENTAL ARCADE, FIFTEENTH STORY
OFFICE BUILDING, 550 SEVENTH AVENUE, NEW YORK
BUCHMAN & KAHN, ARCHITECTS



See Illustration on Page 7

MODERNISTIC DECORATION IN BRICK AND TERRA COTTA
OFFICE BUILDING, 49TH STREET AND MADISON AVENUE, NEW YORK
BUCHMAN & KAHN, ARCHITECTS



INSURANCE CENTER BUILDING, NEW YORK
BUCHMAN & KAHN, ARCHITECTS



DETAIL, TERRA COTTA BELT COURSE, INSURANCE CENTER BUILDING, NEW YORK
BUCHMAN & KAHN, ARCHITECTS



From a Rendering by F. G. Stickel

NEW YORK LIFE INSURANCE BUILDING, MADISON SQUARE, NEW YORK
CASS GILBERT, ARCHITECT



Photo. Wurts Bros.

NEW HOTELS AT 59TH STREET AND FIFTH AVENUE, NEW YORK

SHERRY-NETHERLAND

SCHULTZE & WEAVER AND BUCHMAN & KAHN, ARCHITECTS

SAVOY-PLAZA

McKIM, MEAD & WHITE, ARCHITECTS

AN AMERICAN CHURCH

The Reformed Church of Bronxville, N. Y.

HARRY LESLIE WALKER, Architect

BY

KENNETH KINGSLEY STOWELL

THERE are those who maintain that in the criticism of architecture, or in its appreciation, it is a mistake to give architecture the attributes of human character, and who maintain that architecture must be judged on æsthetic or on intellectual grounds only. Yet we find that the average mass of laymen criticize architecture or appreciate it only in terms of such attributes, as a building seems to possess qualities of dignity, repose, grace and honesty.

When the reaction to architecture is so universally translated into terms of human character, it seems that there must be some truth and reason for it. It is sometimes claimed in this connection that buildings can have no such characteristics; that, after all, it is merely a question of traditional association in the mind of the beholder. Even though we should grant that this is true, when we seek the reason we find that church architecture must of necessity be associated with religious feeling or a direct expression of it. Inasmuch as the religious architecture of the world has sprung from man's instinctive need for worship and organized religious activity, it is only natural that the forms derived from this origin should always be associated with religious expression. There are few who will deny that the great French cathedrals are the greatest concrete expression of organized religion. It is not to be denied also that the parish churches of England are endowed with the spirit of community life and its aspirations. There is hardly to be found a more expressive architecture. In the minds of all who have seen these small churches there is the distinct realization of the calm, simple, direct, and sincere religious feeling of the people of the English rural districts.

The Reformed Church of Bronxville reflects all the attributes of the English parish church,—its dignity, its repose, its staunchness and its charm. Yet this church has a distinctly American feeling which is probably due to those variations in mass, line and detail that are instinctively felt by the architect, but which are exceedingly difficult to analyze. It is rare to find, even today when the quality of architectural design in America has attained such a high standard, a church that produces on the mind of the beholder, whether layman or architect, such an impression of complete fitness and rightness. One feels instinctively in this church that its architectural expression is the result of a sympathetic understanding on the part of the architect which is expressed in every detail of its design, from its mass and proportion to the smallest ornament. The fact that the architect was designing the church in which he was to worship, in fact *his* church, is evident here.

The church possesses qualities that could not be the work of an architect who considered the building merely another commission or just a business proposition or an effort to give the client a church for a stipulated price, a practice often evident in the result.

There were several architects in the congregation who naturally were anxious to have an opportunity to design the new church. The congregation decided that it would be desirable for obvious reasons to hold a competition for the choice of an architect, and the building committee appointed Alexander B. Trowbridge architectural adviser to conduct the competition. The six architects who submitted drawings were, Joseph J. Clark, Tooker & Marsh, Harry Leslie Walker, O. J. Gette, Francis A. Nelson and Allen & Collens. Not all of these were represented in the membership of the church. Realizing the unnecessary burden often placed on architectural competitors, Mr. Trowbridge drew up the competition program in accordance with the standards of the American Institute of Architects, and called for as few drawings as would adequately present the ideas and abilities of the designers. The plans, elevations, and sections were all at the scale of 1/16-inch to the foot, and the perspectives were denied the accessories of colors, shadows, trees, etc., in order that the architecture itself might be judged rather than the beauty of the rendering. The design submitted by Mr. Walker was selected by the jury as being the best.

The ample site of this church is exceptionally well located at the juncture of two wide thoroughfares. The hill on which the church stands commands a view of the wide lawns of the school group across Pondfield Road. The sturdy tower with its graceful detail is naturally and appropriately placed and can be seen from all approaches. The architect was not unmindful of the enhancing beauty of the old trees the site afforded, and the way in which he took advantage of them in his planning amply repaid the effort, as a glance at the illustrations will show. In coöperation with Arthur F. Brinckerhoff, the landscape architect, additional planting was carried out to make the whole a fitting and harmonious setting.

The Bronxville Church was formerly housed in a wooden building of moderate size where the people of the community worshiped for some 75 years. The site on the hill had come to have a sentimental significance with the entire congregation. It was desired that the church should continue without interruption to worship as it had in the past, on the same ground even while the new church was being erected. In the preliminary studies Mr. Walker kept this in mind, and this desire became an accomplished



Photos, P. A. Nyholm

The Lectern

fact by delaying the demolition of the original building until a portion of the new structure was ready to be used for services. The old church building was left on the portion of the site now used as the cloister garth until the Bible School Hall could be used.

It is particularly the plan and arrangement of the Bronxville Church that are most distinctly American. Perhaps in its plan it does not differ materially in its requirements from many other Protestant churches, but in its arrangement it seems to be one of the most successful and workable, as well as most pleasing. The fact that the various portions of the Bible School have been arranged so that they do not interfere, does not preclude the easy access of one group to the other, or the assembly of all the groups in the main hall for such services as may require the attendance of all the departments of the school.

The church is distinctly not an institutional church, although it is essentially a community church. The various institutional adjuncts, such as gymnasium, swimming pool, and provision for other social and extra-religious activities were not considered a part of the church work. It is in purpose a spiritual and religious church. As the teaching of the Bible is necessarily an important part of the program, the portion of the church group devoted to this work has been very successfully planned for its various divisions in accordance with the most recent and approved ideas. The arrangement of the plan separates the church proper from the Bible School in



From a Rendering by Chester B. Price.

Preliminary Perspective, Reformed Church, Bronxville, N. Y.

Harry Leslie Walker, Architect

an excellent way, taking into consideration that the Bible School activities are often held at the same time as the church services. They in no way interfere with each other and are nevertheless in sufficiently close conjunction for all practical purposes.

In the hall of the larger Bible School an excellent workable solution has been achieved. The classes, meeting in the central part for the opening or closing exercises of the school, easily take their places in the classrooms on either side for their class work and are secluded from one another by folding doors and from the main portion of the hall by heavy curtains. The hall itself loses nothing in its attractiveness when the classes are meeting, and the arrangement of clerestory lighting insures adequate illumination at all times. Drawing the classroom curtains at the sides diminishes the apparent size of the hall when it is used for other gatherings than the Sunday study. The stage, while not elaborate, is adequate for such pageantry or dramatic work as may be a part of the activities on various occasions as may be desired.

The various parts of the Bible School have been arranged for their uses in the most adequate way. The little children of the kindergarten and those of the primary grades can enter through their own door at the front of the building without the possibility of disturbing the work of the intermediate or senior students. The junior department can reach its portion of the building on the second floor through an entrance from the court, without necessarily coming



The Pulpit



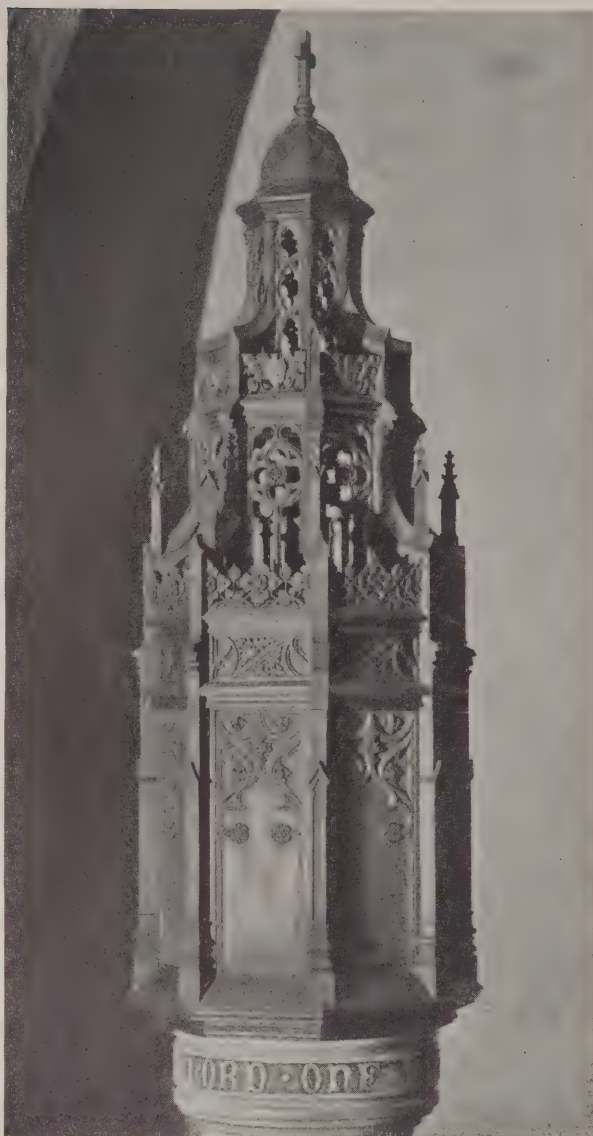
View from Pondfield Road, Reformed Church, Bronxville, N. Y.

Harry Leslie Walker, Architect

in contact with, and certainly without interfering with, the activities of other groups of the school. The plan has been very carefully thought out and is extremely well adapted to the purposes of the women's organizations that meet for religious purposes and missionary work. It will be noted that the large hall can be used for the assembly without interfering with the arrangements for the subsequent work of the organization or with the serving of luncheon or refreshments when the time comes. Either the large hall or the men's and women's social room may be used for work, or for luncheon or tea, as both are connected with the kitchen. Adequate storage space is provided for the materials and accessories of the work. The arrangement of entrances and exits makes possible the use of any portion of the building for its various functions, and when one portion is in operation the other portions can be very easily closed from communication. The location of the room of the

church secretary is perfect, accessible as it is to every part of the building on account of its central location. The pastor's study is directly over the secretary's room, which is in a secluded portion, as it should be, yet in close communication with both the church proper and the large hall. A small room is provided near the pastor's study for the visiting pastor or assistant pastor or for use as a robing room.

The interior of the church itself has a very real religious atmosphere. It is dignified without being cold, as is often the case in churches designed in a Georgian manner. One feels the warmth, repose, and the dignity of its purpose, without losing the intimacy and charm of its communal character. The low Norman piers of the arcades have been placed adjacent to the aisles in such a way as not to interfere with vision. Above them is the clerestory, which provides additional light to the center of the nave. The open trusses are of most pleasing form and are in excellent scale and harmony with the whole in-



The Font Cover
Harry Leslie Walker, Architect

terior. The woodwork of the church is exceptionally fine in proportion and in interest of design and evinces the same feeling for beauty in form and line that characterizes every detail of the church. Particular care and study are shown in the chancel, the pulpit, lectern and font cover,—study that insured correct proportions and relations of parts yet which retained the spontaneity and interest of the design.

The exterior design cannot be assigned to a particular period style of architecture, because of the distinctive handling of mass and void as well as of detail. In spirit the design is akin to the English Perpendicular for the most part. The splendid tower window has the distinction of this style in its tracery, as does much of the other stonework and carving. The segmental arch of the main door is a note hardly to be found in doorways of the English parish churches, which were more often four-centered. The tracery paneling which enframes the doorway is not an unusual

feature, as it has its prototype in some of the late Perpendicular porches of East Anglia churches, yet the treatment is quite individual. The design of the exterior is restrained, and the detail and ornament serve to increase the strength and vitality of the large, well proportioned areas of interesting stone.

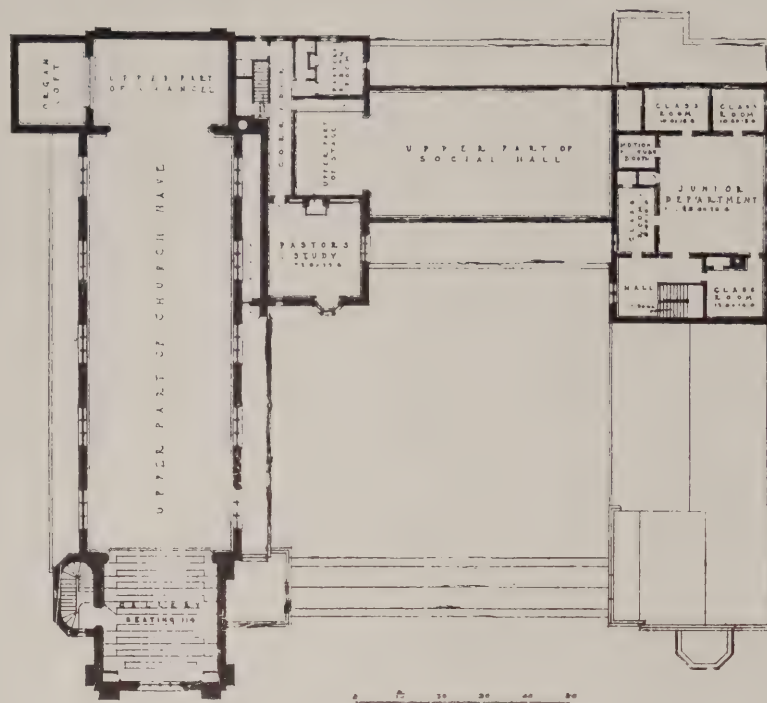
Chimes have been installed in the tower. The music of the bells may well produce in the hearts of the neighbors the same feeling as the curfew when the "ploughman homeward plods his weary way." The business man and the housewife are no less susceptible to the feeling and the urge of the chimes than was the worker in the fields of rural England. As they pass, whether bound for the busy city or for market, the sight of the church is always satisfying to the eye and refreshing to the spirit, either in the morning sunshine, or with the moonlight filtering through the willows and elms and casting their impressive shadows on the rugged stone. At all times the Bronxville church is completely soul-satisfying.



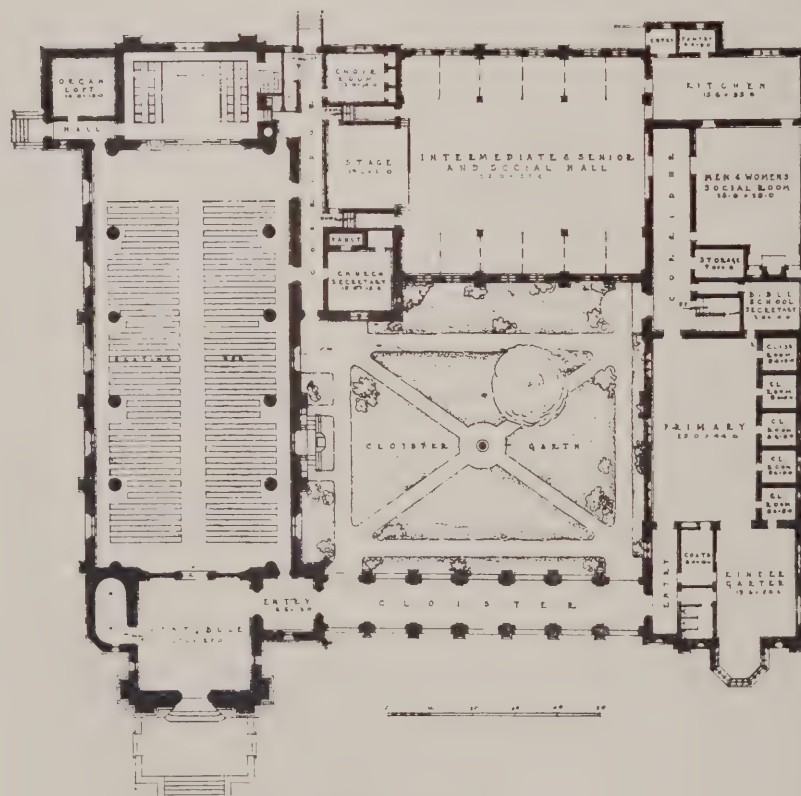
Photos, P. A. Nyholm

Plans on Back

REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT



SECOND FLOOR



FIRST FLOOR

PLANS, REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT

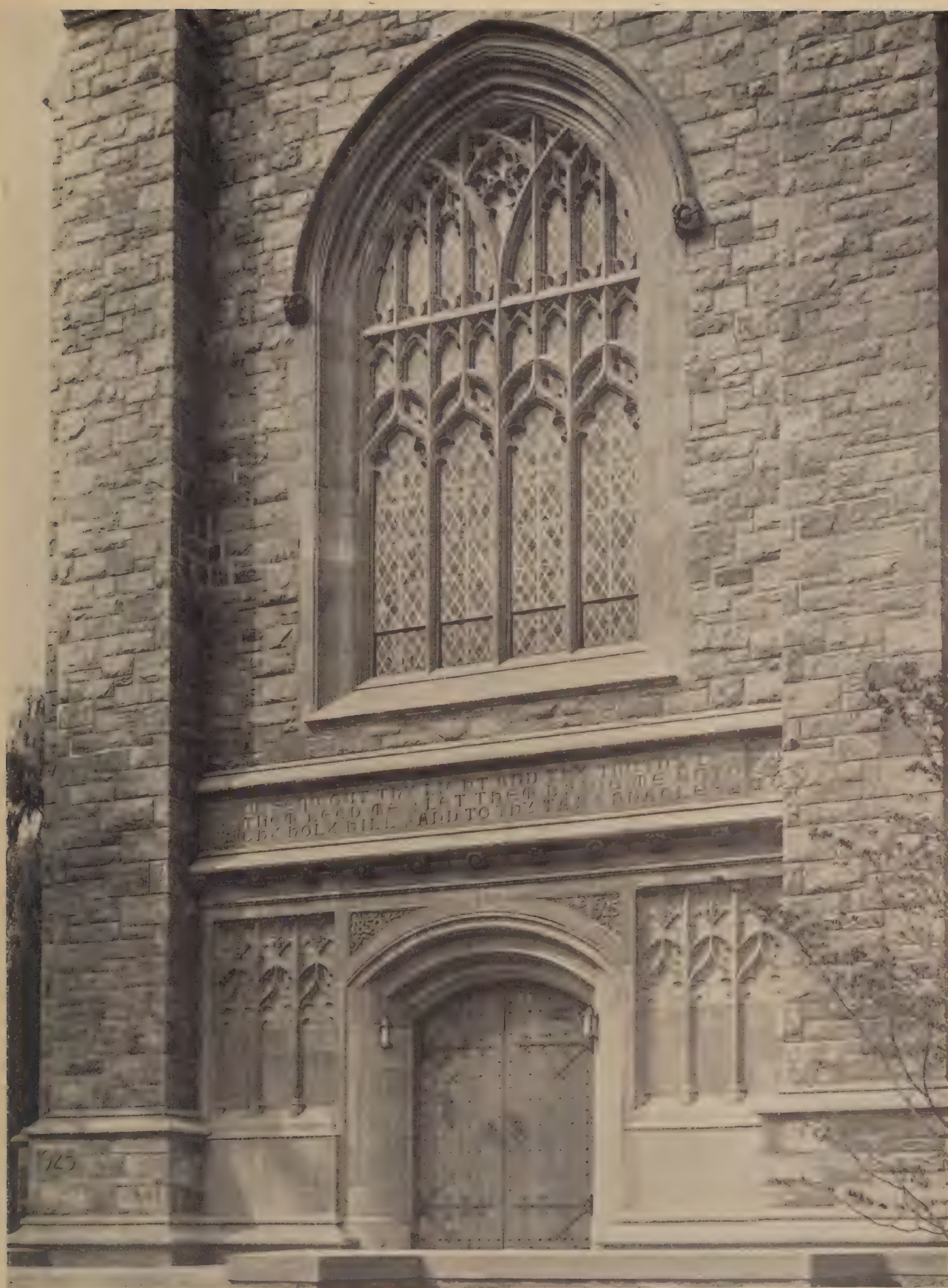


CHURCH AND TOWER
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT

Plan on Back



TOWER FROM CLOISTER GARTH
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT



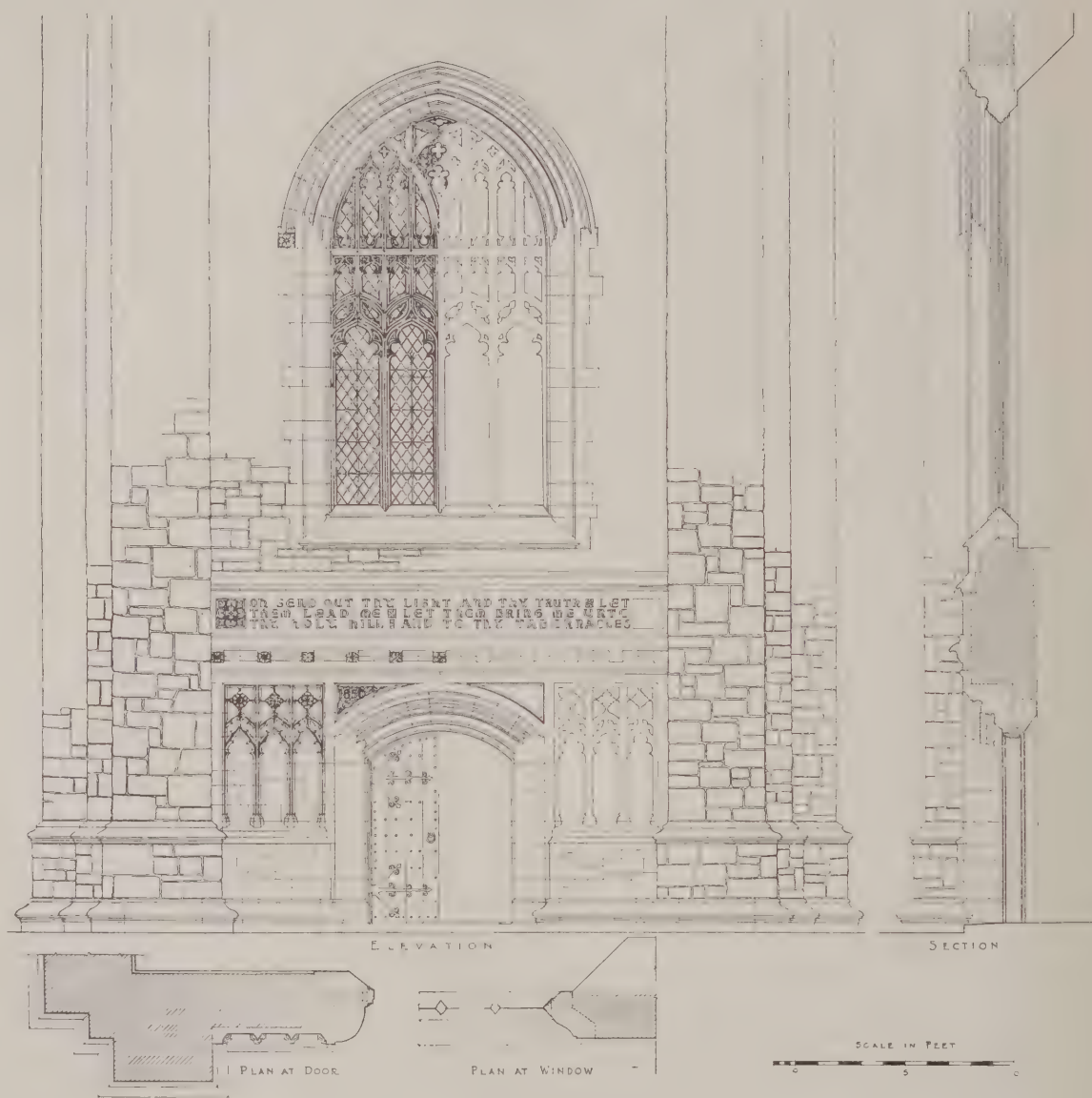
MAIN ENTRANCE
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT

Detail on Back

MAIN ENTRANCE OF CHURCH

REFORMED CHURCH OF BRONXVILLE, N.Y.

HARRY LESLIE WALKER, ARCHITECT



JAN.
1928

NO.
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The ARCHITECTURAL FORUM DETAILS



Detail on Back

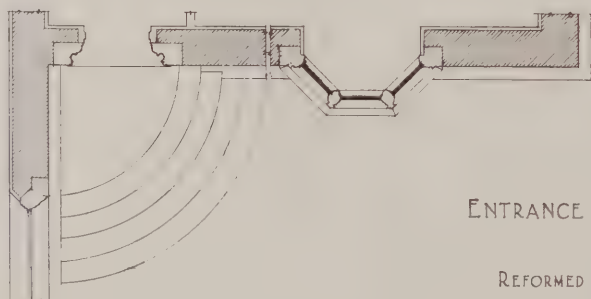
ENTRANCE FROM CLOISTER GARTH
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT



ELEVATION



SECTION



ENTRANCE FROM CLOISTER GARTH

REFORMED CHURCH OF BRONXVILLE N.Y.



HARRY LESLIE WALKER, ARCHITECT

JAN.
1928

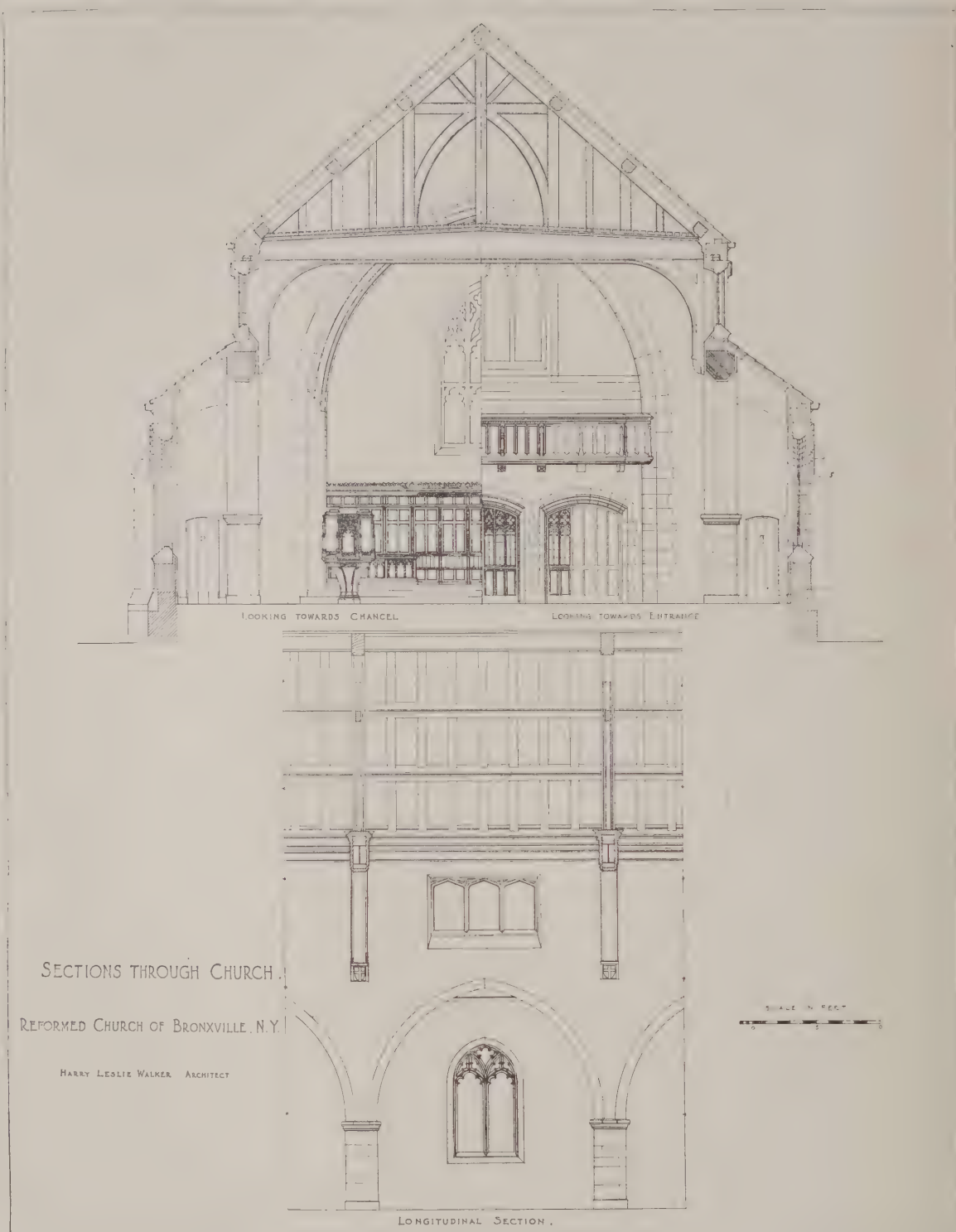
No.
46

The ARCHITECTURAL FORUM DETAILS



Sections on Back

CHANCEL
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT



JAN
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The ARCHITECTURAL FORUM DETAILS



THE NAVE
REFORMED CHURCH, BRONXVILLE, N. Y.
HARRY LESLIE WALKER, ARCHITECT



KINDERGARTEN BAY
REFORMED CHURCH, BRONXVILLE, N. Y. ,
HARRY LESLIE WALKER, ARCHITECT

A MODERN EXPRESSION OF REGENCY STYLE

BY
HAROLD D. EBERLEIN

INFORMED architectural tastes of our own day seem to have a peculiarly strong drawing toward the domestic modes of Classic type that held the field in both England and America at the very end of the eighteenth century and during the opening years of the nineteenth. Without entering into the psychological reasons back of this general preference,—and such reasons undoubtedly exist,—it may be pointed out that the course of evolution has as yet given us nothing better, nothing more suited in its main essentials to a faithful and sympathetic reflection of American ideals and habits of living.

There are, of course, the various so-called "romantic" or "picturesque" modes, culled and adapted from the traditional repertoires of England and France, of Italy and Spain. These are all of them admirable in their respective spheres, and it would be impossible to make any distinction in point of relative excellence between any one of them and the Classic, late Georgian phases already alluded to. But, in avoiding unwarranted comparisons, we must bear in mind that while the several "romantic" or traditional episodes referred to, or the current adaptations of them, may faithfully enough realize all the qualities and requirements of those whose temperamental bias favors expression in such forms, they fail utterly to satisfy the tastes of another equally numerous class,—a class whose temperamental bent is altogether toward the measured pre-

cision, the symmetry, and the nicely ordered elegancies of which the Classic manner, in some form or other, is the outward and visible sign and symbol.

For the inherently Classic-minded, then, the only type of architecture they can consistently live with, the only type from which they can expect to derive substantial and enduring satisfaction, must needs be cast in Classic mould. Elegance, simplicity and polished perfection are just as truly esteemed now as they ever were in the late Georgian period. And, after all, in spite of sundry superficial changes in outward manners, the fundamental outlook of ordered minds in matters of æsthetics is not materially different now from what it was in the early decades of the nineteenth century before a strange combination of romanticism and materialism had played havoc in the realm of popular taste. It is perfectly natural, therefore, that late Georgian qualities, by their fitness to current ideals, should awaken a responsive spirit of sincere appreciation in our own day. In other words, the later phases of the Classic manner have in them the aptitude for being entirely modern and wholly suited to use today.

Of this perennial flexibility and readiness for fresh interpretation no better example could be desired than the house at Purchase illustrated here. There are critics of a certain stamp who affect to regard the use of any eighteenth century architectural type or manner of furnishing as an unnatural effort



Entrance Drive, House at Purchase, N. Y.
Leigh French, Jr., Architect



Main Entrance Door

to thrust the living into the shells of departed generations, a forced attempt to galvanize archæology into renewed youth and vigor. It must be admitted that instances of mummified architecture and decoration are not wanting to give color to their contentions.

This house began, as houses should, with the plan. Hence the vital quality that comes only when the structure is devised to fulfill accurately and exactly the requirements for which it is designed. The elevations grew naturally out of the plan and did not originate in a pictorial preconception into which the plan had to be fitted by hook or by crook; the latter procedure is fatal to vitality, especially when the Classic pictorial conception is limited to a cubic mass, with or without lower flanking wings, and equal room divisions at each side of a central hall. Treat the Classic manner as a living, flexible thing and it will live and bend itself to the demands of each occasion. It will likewise furnish untold opportunities for fresh and interesting composition, as the result here presented indicates. Although the plan shows an absolute departure from the stock symmetrical and equi-divisional plan, which on this side of the Atlantic has become almost a fetish of Classic orthodoxy, the elevations display all that equable balance essential to Classic poise, and that, too, without involving any inconsistency with the interior arrangement. The main mass of the structure, on both the north and south fronts, exhibits symmetrical elevations of convincing dignity and, at the same time, replete with varied incidents that divert the eye and sustain interest. The detached study to the



East Front and Pool, House at Purchase, N. Y.

Leigh French, Jr., Architect

west, with its connecting loggia and curtain wall, and the service wing to the east, though utterly different in point of composition, successfully preserve the balance of the total mass. That much variety of design can be compassed without disturbing the underlying basis of symmetry is exemplified.

Both outside and inside the house evidences an agreeable, logical and satisfying use of materials. The walls are built of brick and painted white; the mouldings of the parapet are of limestone; the slopes of the roofs are of gray slates; the flat deck on top of the roof is covered with lead-coated copper, and the gutters and parapet flashings are of lead. For the veranda, at the west end of the living room, the columns are of cast iron specially designed, and the balustrade above is of wrought iron. This veranda is paved with bluestone flagging, and bluestone flagging is likewise used for paving the loggia connecting the study with the house, for the broad terrace along the south front, and for the copings of all the brick forecourt and garden walls. Inside, the floors of the stair hall and of the hall between the living room and dining room are of black terrazzo divided into squares by narrow brass bands. The stair balustrade is of wrought iron painted white, with polished brass handrail. In the library, which is completely paneled in pine, the floor is of teak. The floors of both the living room and dining room are of French walnut, laid with small rectangular units in the interlocking chequered pattern used with such admirable effect in the parqueted floors of seventeenth and eighteenth century France. Scraped,



Bay Window in Bachelors' House



Fireplace in Bachelors' House, House at Purchase, N. Y.

Leigh French, Jr., Architect

waxed and highly polished, these floors add immeasurably to the dignity of the two rooms in which they appear. The two-leaved doors of the living room and dining room are of heavy carved mahogany.

The materials used and the manner of their employment invite comment not only because they do not ordinarily occur as found here, but also because they go far toward giving that emphasis of stable structure which is so conspicuously present. Visible staunchness of construction, indeed, along with ample proportions, is one of the cardinal characteristics of the house; in this respect it is distinctly reminiscent of the best eighteenth century British manner of building. One feels instinctively that every item is carried out solidly to last and to be the same a hundred years hence as it is today, and close inspection does not belie the appearance; there is none of that thinness, none of that "pasteboardy" aspect, too commonly found in much modern construction, whose first pleasant effect, after close scrutiny, yields to the conviction that it is really little better than so much clever stage setting that cannot stand the test of time, pleasing but temporary.

All the details, both out of doors and inside, are exceptionally well considered and will bear critical examination. The outer doorway on the forecourt and the inner entrance, within the loggia, prove a trustworthy foretaste of what follows. One of the happiest exterior incidents is the veranda at the south end of the living room; like the bay windows on the east terrace, it is one of those engaging Regency touches that characterize the whole composition. In this same category are the round-arched sinkages on the east front, graced by old lead vases on pedestals; likewise, the sinkages on the west front facing upon the forecourt. Echoing them is the arcading of the loggia that connects the little detached study and bounds the croquet lawn west and north. The interior detail in no wise falls short of the promise of the exterior. On entering the circular hall, instinct with the reticent grace of the Regency manner, the design of the wrought iron balustrade, the beauty of the plasterwork and the fashion of the lantern and wall brackets attest a scheme thoughtfully studied in every particular. The doorways and doors from the living room and dining room into the hall, the mantel in the living room, the carved baseboards and chair rails in the living room and dining room, and the niches in the dining room likewise merit special mention as evidences of the same attention to exquisite detail. Use of the water-leaf moulding of the dining room baseboard is an exceptionally pleasant departure from the customary treatment of such features.

It should be noted that every particular of the decoration and furnishing was determined by the architect; the result, it may be added, is highly satisfactory and shows excellent judgment. The dining room exhibits an unusually pleasant color treatment. The walls are a pale pearl-lavender,—that elusive color so much favored in the Regency period,—and

the woodwork is a subtle coral hue picked out in gold. The gilding on the coral ground is particularly effective on the compo figures on the antique mantel, on the sunburst carving in the heads of the niches, and on the muntins of the window. The curtains are of green figured damask, made and hung in a characteristic Regency manner. In the hall the walls are a light sea green, another favorite Regency color, with the niche on the stairway and the reveals of the arches in white. The walls of the living room are a rich apricot, with the dado a deeper tone of the same color. Here the curtains are of light green glazed chintz with a flowered figure. The coloring in the rest of the house is carried out in the same interesting manner, making for a unified effect.

One of the most fascinating features of the house is the little detached study with a bedroom above it. The floor is paved with brick, soaked in oil and waxed, and the walls are paneled with vertical pine boarding, with moulded edges, from floor to ceiling. At one side of the ample fireplace, a stair concealed in the thickness of the wall ascends to the bedroom and completely appointed bath above; at the other side of the fireplace, there is a fully equipped kitchenette, with a refrigerator, likewise accommodated in the thickness of the wall and closed in by doors in the paneling so that it is entirely out of sight when the doors are closed. The bedroom above is also lined with vertical boarding from floor to ceiling and painted green-blue picked out with vermilion; the bed is built into the wall, in the manner of the old Norman beds, still common in some parts of France, the width of the bed corresponding with the width of the bathroom, so that the floor space of the bedroom is an unbroken rectangle in shape.

The swimming pool, to the east of the main body of the house, is of graduated depths. While perfectly calculated for the diversion of swimming, it has been so treated that it also serves the landscape purpose of a water garden, giving that charm to the ensemble that only water with its ripples can give.

As to the matter of architectural style, while the tone of the detached study is largely French, and while the interior of the library and other incidents here and there suggest a reversion to an earlier fashion, the treatment in the main is a very convincing exposition of the Regency manner. Without slavish and pedantic adherence to precedent, the architect has used a reasonable liberty of interpretation in combining *motifs* so that the total result manifests harmonious vitality as well as vigor of conception. Furthermore, without any obvious or actual striving for effect, the house has a refreshing dramatic quality quite in contrast with the air of desiccated propriety too commonly and wrongly associated with composition in the Classic manner. To this inherent dramatic quality, which is altogether logical and commendable, is due not a little of the compelling interest attaching to what is unquestionably one of the outstanding and most important examples of current domestic architecture.



DETAIL OF EAST OR GARDEN FACADE
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

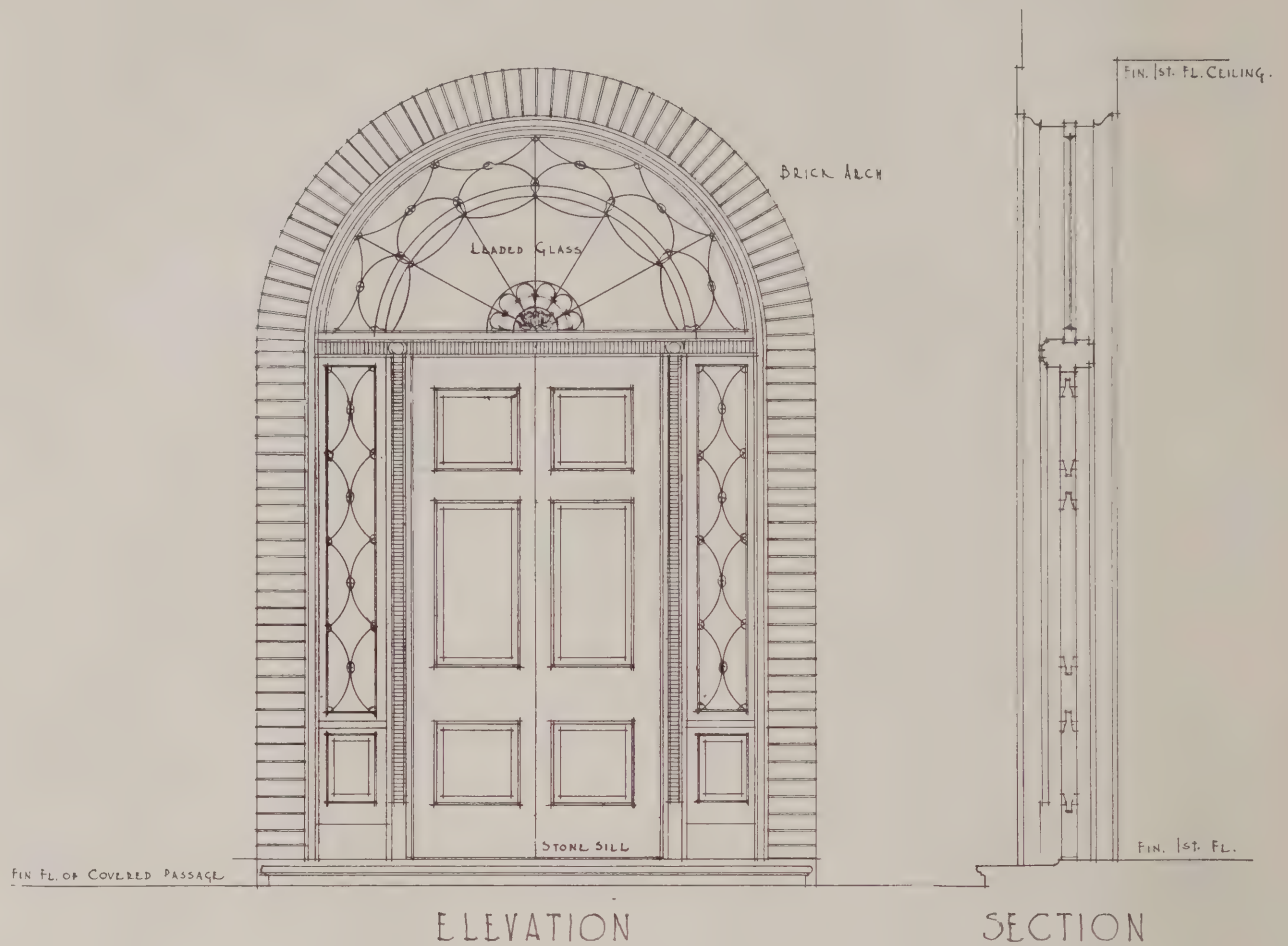


DETAIL OF GARDEN TERRACE
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT



DETAIL, ENTRANCE FROM FORECOURT
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

Detail of Main Door on Back



PLAN

DETAIL OF FRONT DOOR



JAN.
1928

(THIS DOOR IS ILLUSTRATED ON PAGE 46)

No.
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The ARCHITECTURAL FORUM DETAILS

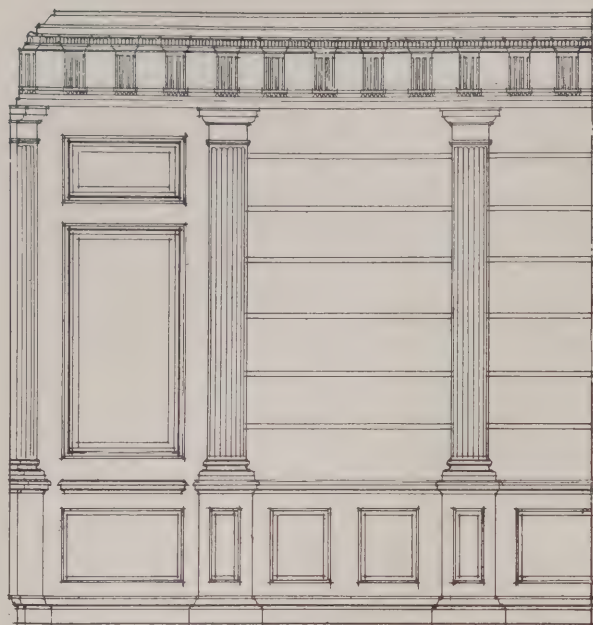


DETAIL OF SOUTH PORCH
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

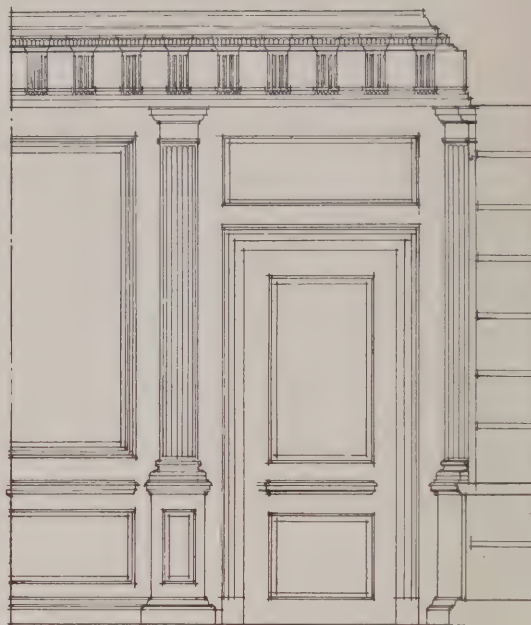


CORNER IN LIBRARY
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

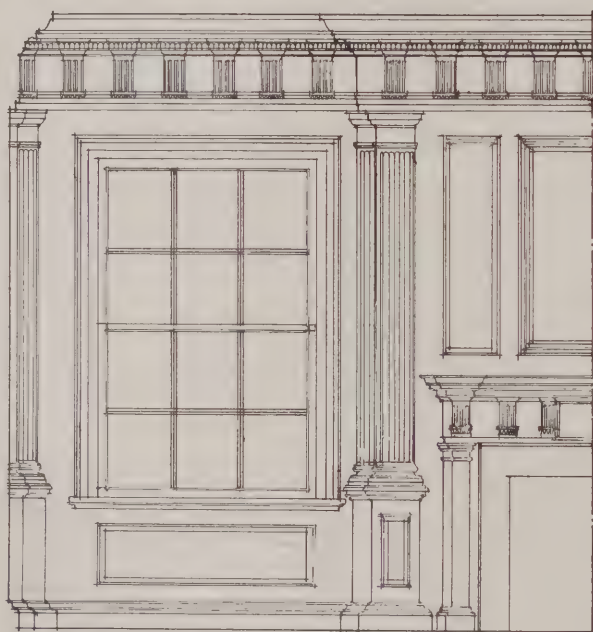
Detail on Back



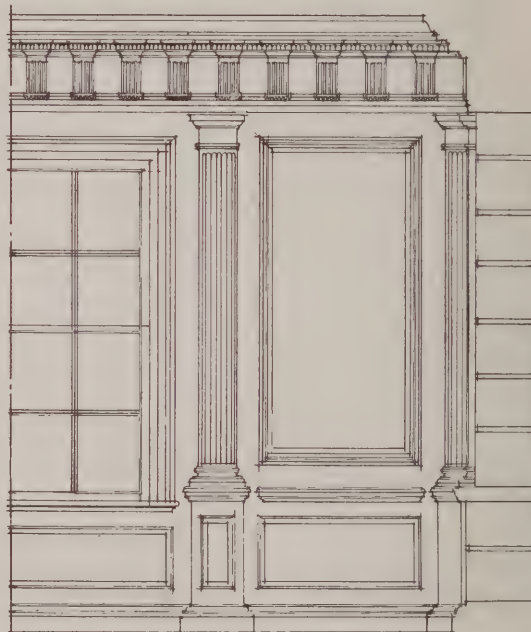
HALF NORTH WALL



HALF EAST WALL

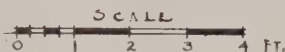


HALF SOUTH WALL



HALF WEST WALL

DETAILS OF LIBRARY



JAN.
1928

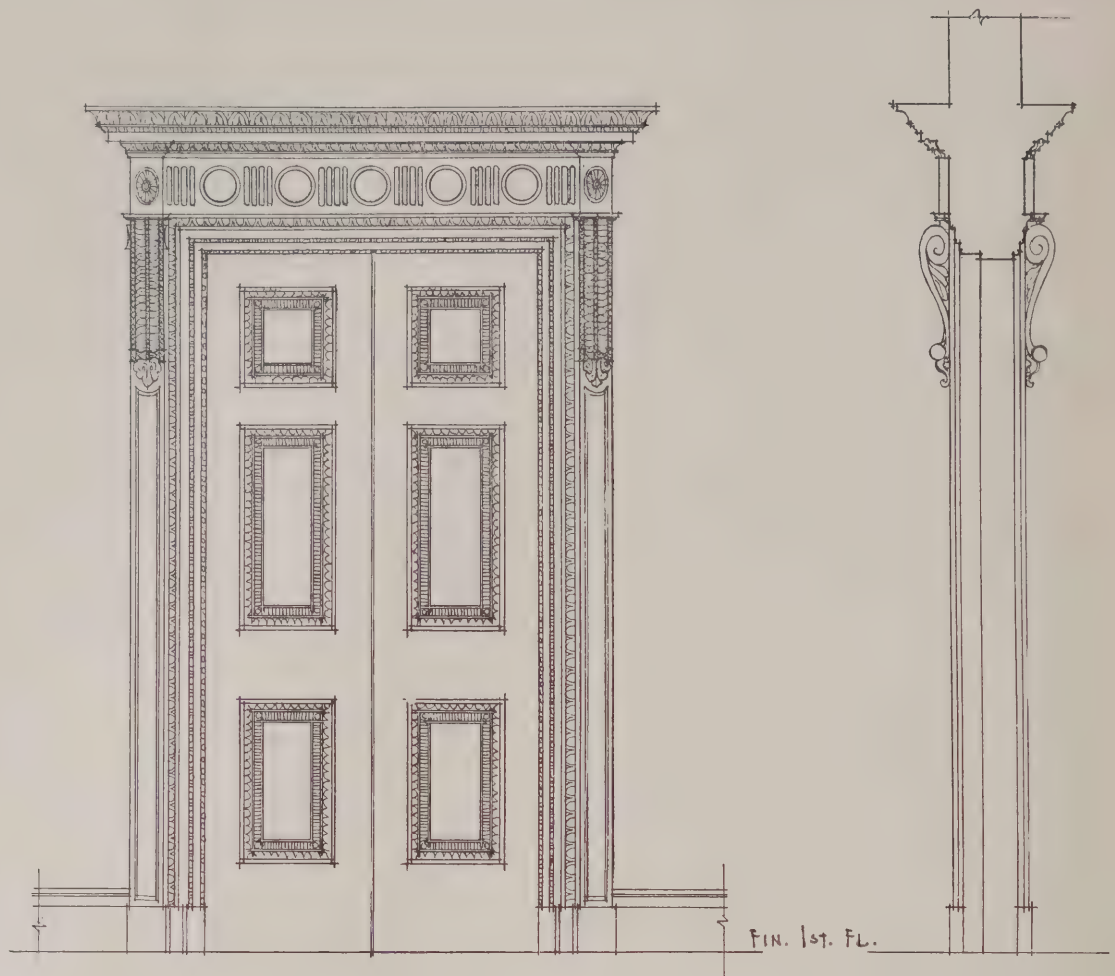
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49

The ARCHITECTURAL FORUM DETAILS



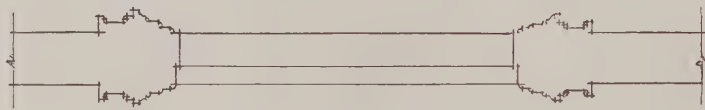
Detail on Back

DOOR INTO DINING ROOM
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT



ELEVATION

SECTION



PLAN

DETAIL OF DOOR
FOR LIVING ROOM AND DINING ROOM



JAN.
1928

No.
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The ARCHITECTURAL FORUM DETAILS

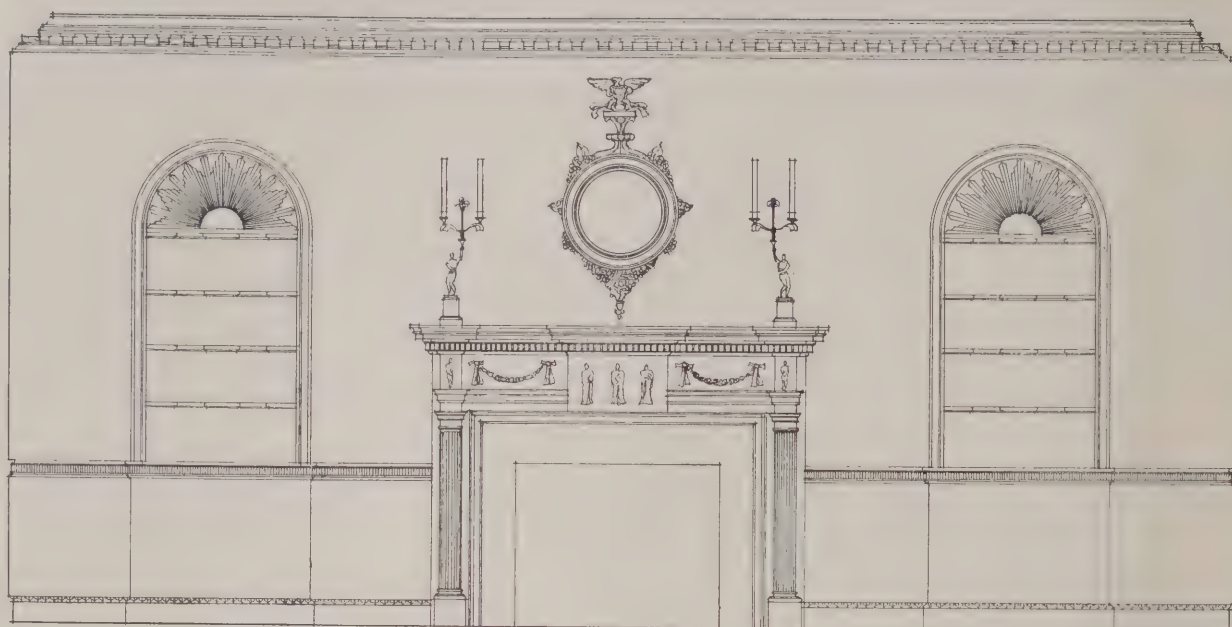


WEST WALL OF DINING ROOM



FIREPLACE IN LIVING ROOM
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

Details on Back

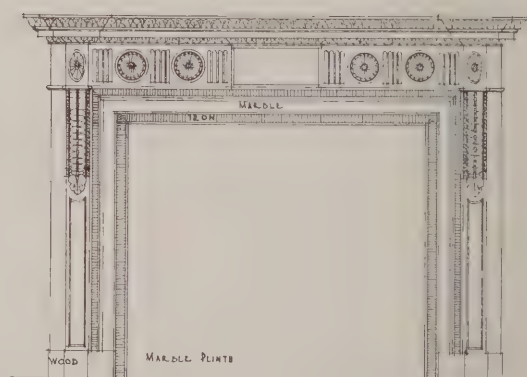


ELEVATION

WEST WALL
OF
DINING ROOM



LIVING ROOM
MANTEL



JAN.
1928

No.
51

The ARCHITECTURAL FORUM DETAILS



ARCHWAY IN EAST HALL



LIVING ROOM
HOUSE AT PURCHASE, N. Y.
LEIGH FRENCH, JR., ARCHITECT

PAVILIONS IN THE AIR

ZONING laws are not alone responsible for the interesting and original character developed in the architecture of New York during the past ten years. The desire and necessity of concealing roof tanks and the tops of elevator shafts have led to a variety of successful solutions of this problem. These illustrations are from photographs of the architectural towers and roof structures on some of the recently completed commercial and hotel buildings in

New York. This interesting group of "pavilions in the air" tell their own story and require no explanation. Few of the hurrying throngs down in the canyon-like streets ever have time or interest to look up in the air to discover these often well designed architectural screens which conceal important parts of the mechanical and plumbing equipment of tall buildings. It is hoped that this group of illustrations may have suggestion and inspirational value.

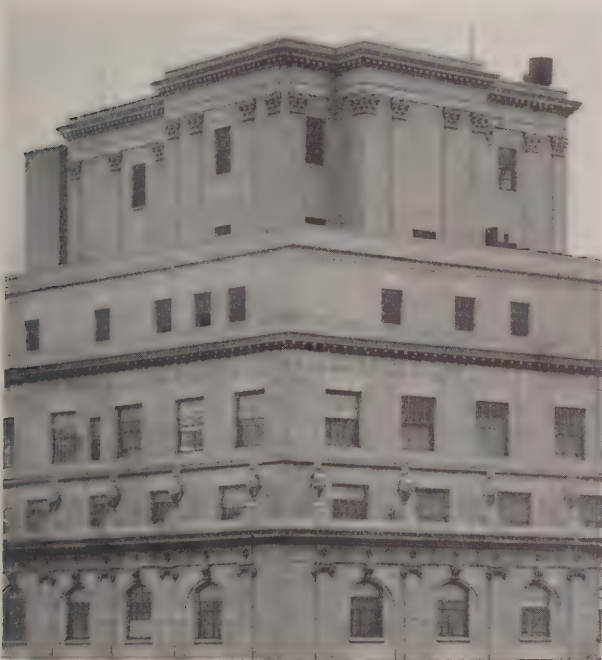


Photos. Wurts Bros.

Aeolian Building, New York
Warren & Wetmore, Architects



Building at 8th Avenue and 36th Street, New York
George & Edward Blum, Architects



Photos. Paul J. Weber

Ambassador Hotel, New York
Warren & Wetmore, Architects



Hotel New Weston
Robert J. Lyons, Architect



PARK LANE HOTEL (in Foreground)
SCHULTZE & WEAVER, ARCHITECTS



HOTEL BEVERLY, NEW YORK
EMERY ROTH & SYLVAN BIEN, ARCHITECTS



BUILDING AT 274 MADISON AVENUE, NEW YORK
SLOAN & ROBERTSON, ARCHITECTS



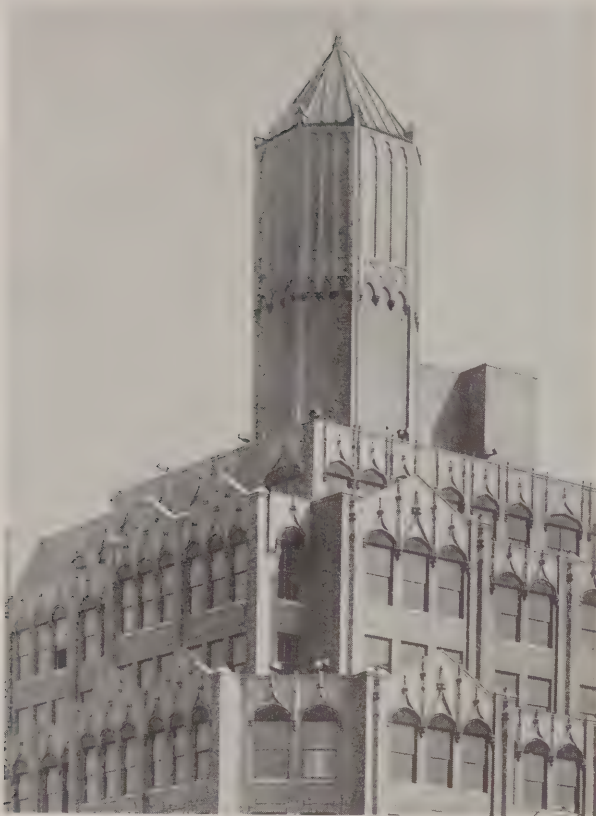
EAGLE BUILDING, NEW YORK
ROUSE & GOLDSTONE, ARCHITECTS



BUILDING AT 277 PARK AVENUE
McKIM, MEAD & WHITE, ARCHITECTS



ALLERTON HOUSE, MADISON AVENUE AT 55TH STREET
ARTHUR LOOMIS HARMON, ARCHITECT



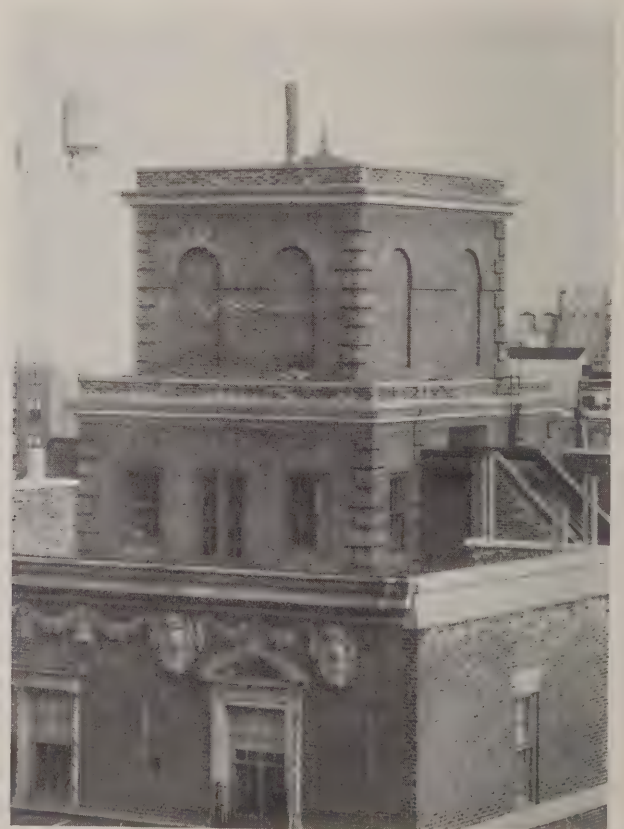
BUILDING AT 245 FIFTH AVENUE
GEORGE FRED PELHAM, ARCHITECT



HOTEL ELYSEE, NEW YORK
HARRY ALLAN JACOBS, ARCHITECT



HOUSE OF MRS. WHITELAW REID, NEW YORK
MCKIM, MEAD & WHITE, ARCHITECTS



HOUSE AT 22 EAST 36TH STREET, NEW YORK
LOUIS E. JALLADE, ARCHITECT

ARCHITECTURAL AVOCATIONS

THE DIGRESSIONISTS

BY

ONE OF THE LEAST OF THESE

"Da Vinci is our patron saint;
He spent his life digressing.
He knew damn well the way to paint,
And kept his critics guessing."

THUS in song do the Digressionists acknowledge the leadership of Leonardo, for was he not preëminently a Digressor? Learned in higher mathematics, skilled in engineering, wielding a mean mallet in sculpture and a meaner pen in his scientific literature, his fame finally rests on what he achieved in painting. Michelangelo also was so versatile that it is difficult to decide which art was his vocation and what art his digression. We who modestly follow in the footsteps of these giants frequently trip on the imprints they made in the sands of time. We are immensely attracted by the idea of not forever traveling on a single-track road, and we welcome the thought of a branch line which will permit us to enjoy participation in what the world offers in the allied arts, arts which are many and varied.

The Digressionists are a group of 25 busy architects who have learned the art of employing what little spare time they have in excursions into other fields of artistic endeavor. As indicated by their symbol of the flying fish, they are out of their element, but unlike that mysterious little creature, they do not remain submerged most of the time. Many of them are well known members of the architectural profession. A Digressionist is free to paint, model, etch, draw, photograph or express himself in any of the graphic arts, so long as he does not become too architectural. The unwritten law of the society requires that a Digressor who most fully qualifies for that title be one who takes up a new field in art, something for which he has not necessarily been trained but for which he shows a natural aptitude. He is not forbidden to exhibit sketches of architectural subjects, but by common consent such efforts are not real digressions even when they are superlatively well done. Many an architect learns how to make a fetching little water color before he is capable of drawing a full-sized detail of a window box. In consequence of the almost universal love of water color rendering among the members of this

little society, it is not surprising that a large portion of the material submitted for exhibition is of landscapes or seascapes in that most adaptable medium.

In 1908 J. Monroe Hewlett remarked in the presence of Charles Ewing that inasmuch as a good deal of collaborative work was being done by architect, painter, and sculptor, it might be a good thing for all concerned if the architect, who usually has the controlling voice in this collaboration, were to try his hand at painting and sculpture. It was believed that in no other way could he so well understand the difficulties which usually beset the painter and the sculptor when they are engaged to embellish buildings. It was a big idea, prompted by a desire to be fair to the collaborating artists, who are not often given satisfactory surfaces for mural decorations or adequate spots for sculptural adornment. Messrs. Hewlett and Ewing learned that a similar idea was hatching in the mind of Grosvenor Atterbury, so a conference of the three was called and "The Digres-

sionists" sprang into being. Today, "digressing" includes craftsmanship, poetry and prose writing, musical composing, piano and violin playing, singing, etc. The field is wide open to include any form of expression which is not the architect's vocation.

In the years which have elapsed since the founding in 1908, 38 names have been enrolled on the roster. Of these, five, or about 14 per cent, are no longer living. These are Austin Lord, Breck Trowbridge, Russell Hewlett, Cary Rodman and Bertram Goodhue. Of the remaining 33, William A. Boring and Edward L. Tilton have resigned, to assume the title of *Digressor Emeritus*. John Benson was placed in this same rating because he forsook architecture and became a professional painter. William A. Taylor was induced to drop architecture for big business. Retirement to a distant city caused his name to be omitted from the rolls. Others who are no longer members are Welles Bosworth, Henry Hornbostel, Louis Metcalfe and Frank Holden. The present membership of 25 includes: The founders, Messrs. Hewlett, Ewing and Atterbury; Fred Ackerman, Chester Aldrich, William T. Aldrich, George Chappell, John Cross, William A. Delano, Howard Greenley, Wallace Harrison, Edward Howes, Fred



The Digressionists' Medal
The Flying Fish Symbolizes One Digressing from One's
Natural Element

Hirons, H. V. B. Magonigle, Julian Peabody, Robert Potter, Hubert Ripley, John Tompkins, Alexander Trowbridge, Ernest Tyler, Arthur Ware, Lawrence White and Edgar Williams. Frank Crowninshield, in recognition of his very great interest in the society, evinced in many ways, has been made an honorary member. Such is the society's membership.

For a long time it has been the custom to have the digressions judged by a jury of non-members, selected chiefly from the ranks of professional artists and occasionally from among the architects. Practically every painter and sculptor of rank in New York has at one time or another served on this jury. The members of the jury are given to understand that they are expected to earn their dinners by holding a judgment in the exhibition room during the hour or two preceding the dinner. The bronze medal of the society is awarded to that digression in the graphic arts which, in the opinion of the jury, has the greatest distinction. Three or four honorable mentions are awarded to other exhibits which are second in merit to that receiving the medal. The medal has been awarded 21 times. J. M. Hewlett received it five times, Edward Howes four, Messrs. Taylor, Delano, Chester Aldrich and Chappell two each, and Russell Hewlett, Ewing, Benson and Peabody once. In this way honors have been awarded.

The official records of the society show that during the past 20 years there have been 58 jurymen, and that 20 per cent of these have died. Shall it be assumed from a comparison of this statement with the mortality of the Digressors, only 14 per cent of whom have died, that digressing prolongs life? Or shall we conclude that judging digressions is a hazardous occupation? Whatever the answer, the members will testify that there has been no influence in their lives more stimulating to their continued growth than this little annual gathering. At the dinner a chief Digressor is chosen to head the group at the next succeeding exhibition. It is his duty to send to all members a general reminder during the winter that on a certain day in April the year's digressions will be delivered at the Coffee House Club and that they are all expected to get busy and prepare something for the show. There are usually about 75 exhibits. As previously explained, the majority are water colors. These are sometimes of high quality, quite good enough for any water color show. Hewlett, Magonigle and Atterbury have frequently sent oil paintings. Howes and Greenley have etched. Ackerman has gone far in his researches in pictorial photography. Chester Aldrich and Breck Trowbridge divided the honors in sculpture. Delano, besides showing charming water colors, exhibited delightful dancing figures in black silhouette on large mirrors. Tyler has shown crayon portraits. White has sent in a series of *ex libris* designs at the scale required for library use. As this is written somewhat from memory, it is possible that a few types of digression in one form or another of the graphic arts have been omitted from this list.

Several years ago Frank Crowninshield, while serving as a juror, offered an annual prize in the form of a cup to stimulate digressions in fields outside of the graphic arts. This has proved to be a very popular innovation, bringing out craftsmanship, music, poetry, prose writing, etc. The first winner in this competition was the late Breck Trowbridge, who delighted everyone with his skill in fabricating a hunting bow with arrows and a collection of trout flies. He added to the interest aroused by this exhibit by telling of his experiences as a hunter with this archer's outfit. Bob Potter, an enthusiastic astronomer, was awarded the Crowninshield cup for poetry, written and declaimed. In '26 the cup was awarded to George Chappell for his wit and humor in the minutes read at the '26 dinner covering the dinner of the year before, and for his skill in reading them under difficult circumstances. In 1927 Chester Aldrich wrote the words and music of a song entitled "The Flying Fish," and Alexander Trowbridge sang the song to Aldrich's accompaniment. For this exhibit of collaboration in the arts both names were inscribed on the Crowninshield cup presented then.

TO BRECK TROWBRIDGE
By J. Monroe Hewlett

April 29, 1925

Two years ago, around this festive board,
We listened to our Master Bowman tell
Tales of the fashioning of arrows straight,
Balanced and feathered, tipped and finished well.
And how to test the wood from which a bow,
Finer by far than ancient archer knew,
May still be formed by art and care and craft
To hold the course of arrows strong and true.
He told us of the wild swan's ghostly flight;—
And now he's gone to join that mystic quest.
In hunting grounds beyond the setting sun,
He learns the meaning of our "going west."

THE OLD AMATEUR
By R. Burnside Potter

What matters it that, weary and alone,
I sit and think of things I might have done?
What matters it that wife and children shun
In me a dreamer, a mere rolling stone?
What matters it that rustic neighbors fear
In me a madman, all because I know
The motions of the comets and the flow
Of time, that travels on from year to year?
What matters it? There are far better men
To count the days and seasons, as they run,
And weigh this planet that we dwell upon.
But yet, I feel it matters somewhat, when—
What matters it?—I see, across the wire,
The transit and the star of my desire!

One of the members is at present deeply engrossed in the mysteries of stained glass windows, and is learning how to paint and etch upon glass, how to

bake it, how to cut stained glass, and how to "lead" it in a window. He is not doing it solely for fun, but hopes to learn enough about this alluring craft to enable him to appreciate the difficulties and the beauties of the work executed by professional window makers. Another member has found pleasurable excitement in an excursion into lithographic drawing on stone and on transfer paper. He plans to exhibit some of this work next April. More might be divulged on the delightful programs, mostly impromptu in character, which are offered by the members after the dinner. Here songs by Chappell, Ware, Greenley and Trowbridge are interspersed between sonnets and poems by Potter and Hewlett. Magonigle is always urged to give his famous rendition of the mating calls of wild animals; Atterbury has several times played violin obligatos to songs. It is probable that there are still to be uncovered certain talents among the more diffident members, and

that in the next few years this list of legitimate and *ex-curricula* digressions will be somewhat augmented.

Professional artists who judge these digressions have said that the one thing which impressed them more than any other was that all this artistic work was done for the fun of the thing. The dollar sign is not present in any form. I am not aware that in the 20 years since this society was founded a painting has been offered for sale, though it may be that here and there when a Digressionist was hard up he may have tried the experiment of finding out whether the public agreed with the jury in voting merit to a painting! The contact between the members and the jurors has been well worth while, for the professional artist learns that the architect is a regular fellow after all, in spite of his apparent neglect in omitting from his buildings the surfaces upon which the painter and the sculptor seek immortality; thus both jurors and Digressors benefit.



A Digressionists' Jury Announcement

SMALL BUILDINGS

THE SECOND COMMON BRICK HOUSE COMPETITION

PRIZE WINNING AND HONORABLE MENTION DESIGNS

THE Second Common Brick House Competition sponsored by the Common Brick Manufacturers' Association of America was announced early in 1927 to close November 1. This was an unusually interesting type of dwelling competition, because it called for photographs and plans of houses and bungalows which have been actually constructed with exteriors of common brick. Most of the national architectural competitions which have been held in this country have called for sketch plans and elevations, but when actually completed houses are called for, as in this competition, it is obvious that architecture must pass the acid test of reality.

The requirements of the competition included no limitation as to the sizes of houses nor to the construction of exterior walls, except that the surface of the exterior walls was required to be at least 75 per cent common brick under this definition: "Common brick, as defined by the Common Brick Manufacturers' Association of America and for the purpose of this competition, is a solid building unit of burned clay having a natural surface not treated to produce special effects in color or texture of the individual brick, but including clinker, overburned, and cull brick." These varieties of brick are easily had.

Each entry in this competition consisted of three photographs, including a full perspective view of the house, an architectural detail, and a close-up photograph of a portion of the exterior wall which would clearly show the details of the brickwork, such as its texture, pattern, bond, etc. Plans included the cellar and floor plans, drawn to $\frac{1}{8}$ -inch scale.

The competition announcement stated that "the jury will consist of three architects of national reputation in residential design. The jury will meet within one week after the termination of the competition, and competitors who win prizes or honorable mention will be notified the day after the jury completes its awards. The judgment will be based on architectural design, efficient planning, and ingenuity displayed in the development of attractive exteriors of common brick. All competitors will be notified as to the results of this competition within one week after the jury has completed judgment."

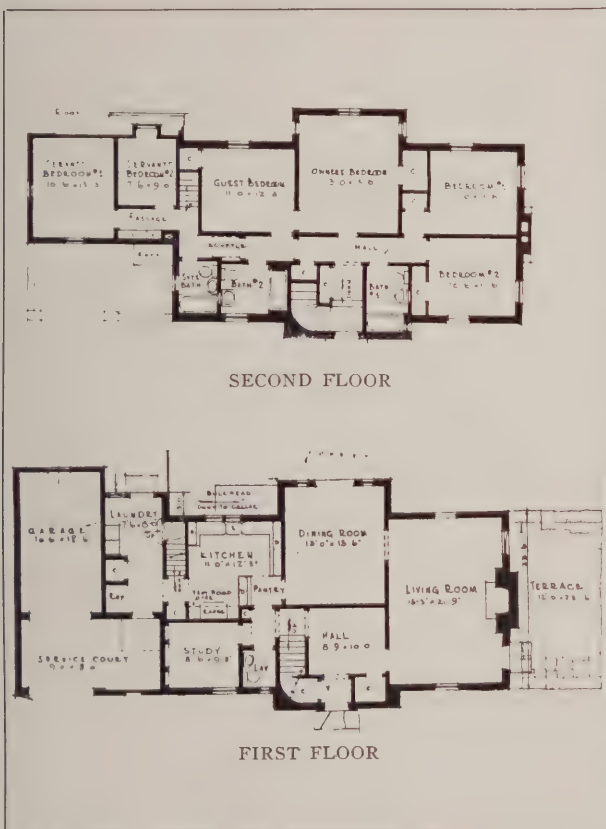
The jury, consisting of C. Stanley Taylor of New York, Alexander Donaldson of Detroit, and Frank B. Meade of Cleveland, met on November 2 to complete the judgment. Twenty-four awards were made: First prize, James C. Mackenzie, Jr., New York; Second prize, R. C. Hunter & Bro., New York; Third prize, Frederick Kennedy, Jr., Pasadena; Fourth prize, Bohnard & Parsson, Cleveland. Honorable mentions were awarded in this order: A. C. Runzler, Milwaukee; Burns & James, Indian-

apolis; Eldridge T. Spencer, Berkeley, Calif.; Alfred Easton Poor, New York; Arthur L. Lovelless, Seattle; La Beaume & Klein, St. Louis; Robert Maurice Trimble, Pittsburgh; La Croix & Memmler, Milwaukee; La Beaume & Klein, St. Louis; William Addison McElory, Houston; and special mentions were awarded to Flint & Broad, Dallas; Owen James Southwell, Atlanta; Lester J. A. Julianelle, New Haven; Hans Gehrke, Detroit; Smith & Walker, Boston; H. Raymond Heckman, Reading, Pa.; Donald W. Southgate, Nashville; Eisenberg & Feer, Boston; Robert O. Derrick, Detroit; William T. Braun, Chicago.

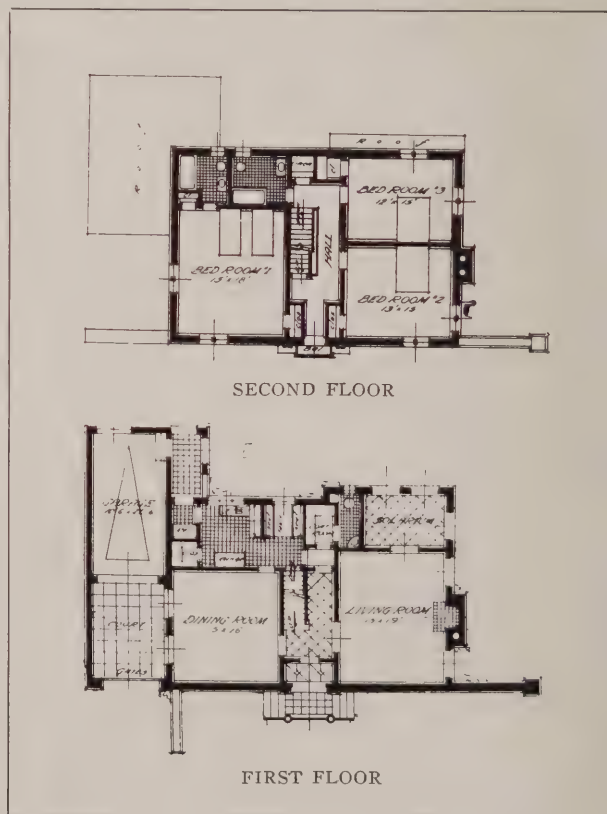
On other pages there will be found the prize-winning houses, the ten honorable mention houses, and two of the special mention houses. In commenting on the entries in this competition, it was the opinion of the jury that they had never seen in any residential competition so many consistently good designs. Of the group of over 150 entries there were very few which could be discarded at first glance, with the result that the rendering of judgment was extremely difficult, and the balance in favor of one house as against another was often extremely delicate. The designs were of an unusual quality.

It is to be remembered, in considering the winning designs, that the specific terms of the competition established the basis of judgment in three parts,—(1) architectural merit without respect to landscaping; (2) efficient planning; and (3) ingenuity displayed in the development of attractive exteriors of common brick. With these three factors in mind, the jury examined each entry with extreme care. The plans of the various prize-winning houses were analyzed from all practical points of view, including that of economy of construction. Careful consideration was given to the provision for natural lighting and ventilation, ease of circulation, and general efficiency for domestic administration. The architecture in all cases was called upon to pass the test of conservative good taste, and little consideration was given to what might be termed "freakish" designs. It was felt that as the results of this competition would be generally broadcast to the public, every effort should be made to admit only good precedent.

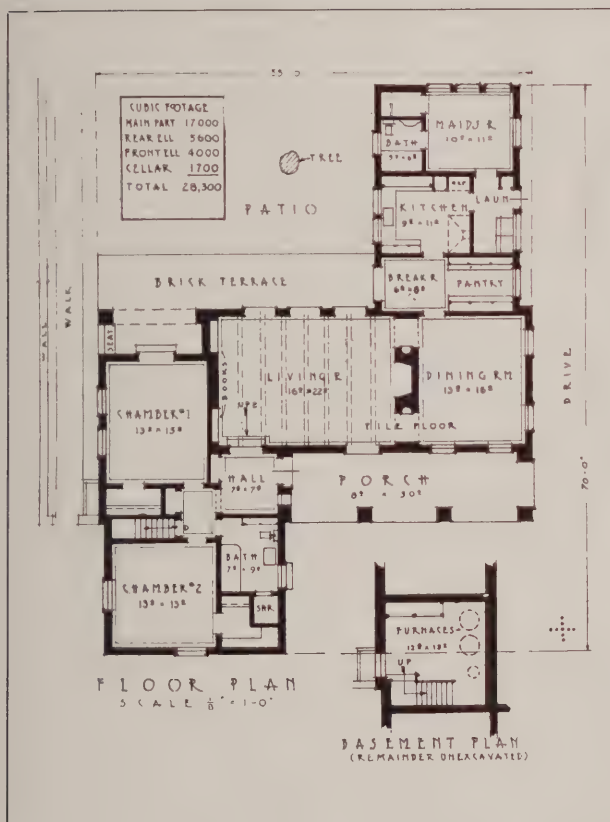
The jury was greatly interested in the broad range of brick effects, which included many ingenious combinations of patterns, bonds and textures. The houses illustrated herewith indicate clearly the possibilities of carefully studied common brick exteriors, using not only the more conservative textures but also such varieties as "skintled" brick, along with extruded mortar joints, painting of the brickwork, and a number of combinations of forms and colors.



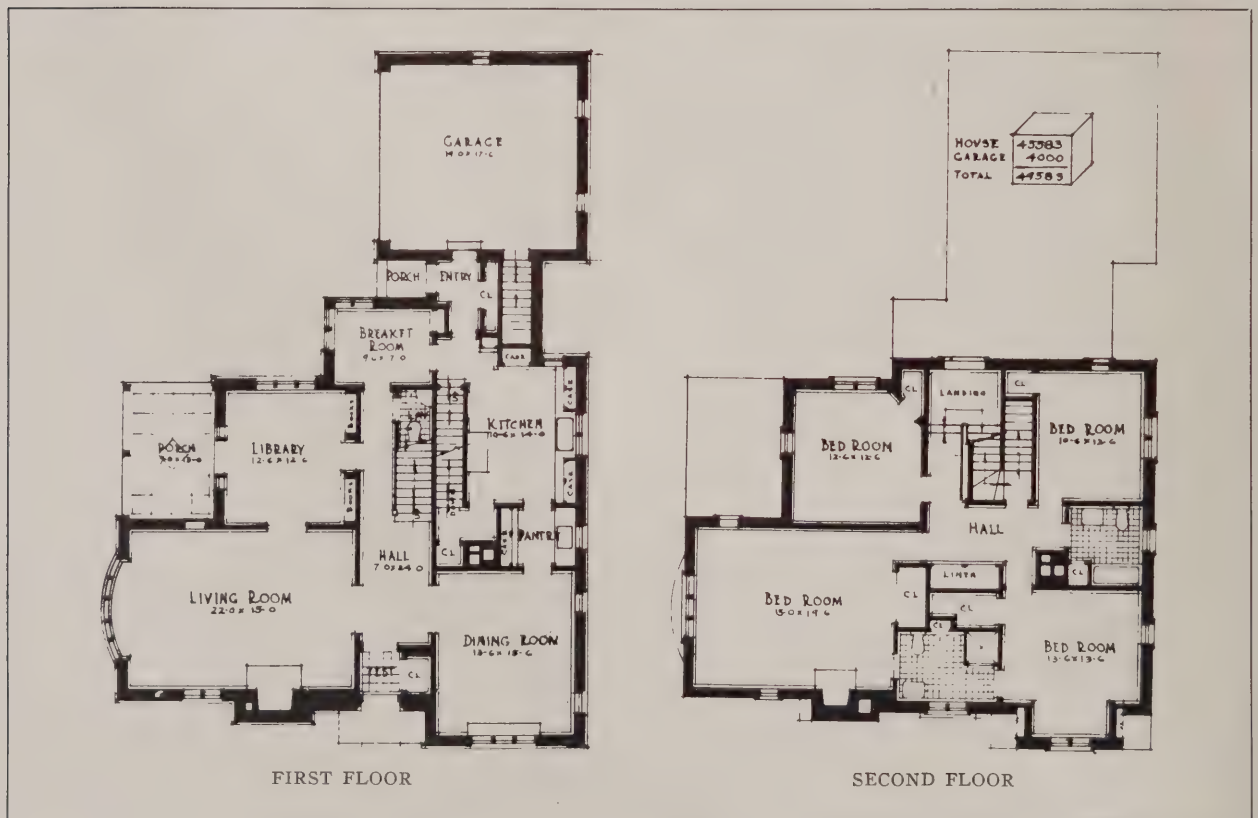
FIRST PRIZE
SECOND COMMON BRICK HOUSE COMPETITION
JAMES C. MACKENZIE, JR., ARCHITECT, NEW YORK



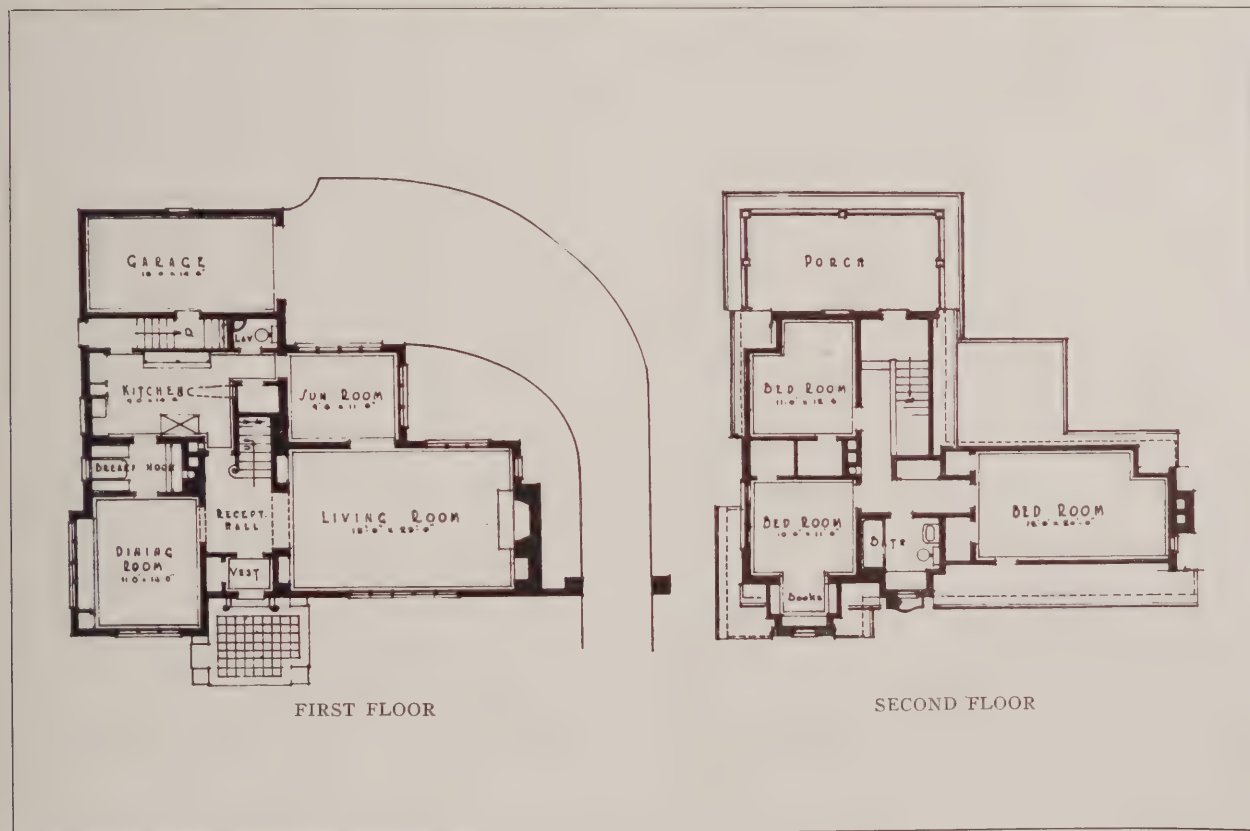
SECOND PRIZE
SECOND COMMON BRICK HOUSE COMPETITION
R. C. HUNTER & BRO., ARCHITECTS, NEW YORK



THIRD PRIZE
SECOND COMMON BRICK HOUSE COMPETITION
FREDERICK KENNEDY, JR., ARCHITECT, PASADENA



FOURTH PRIZE
SECOND COMMON BRICK HOUSE COMPETITION
BOHNARD & PARSSON, ARCHITECTS, CLEVELAND



FIRST MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 A. C. RUNZLER, ARCHITECT, MILWAUKEE

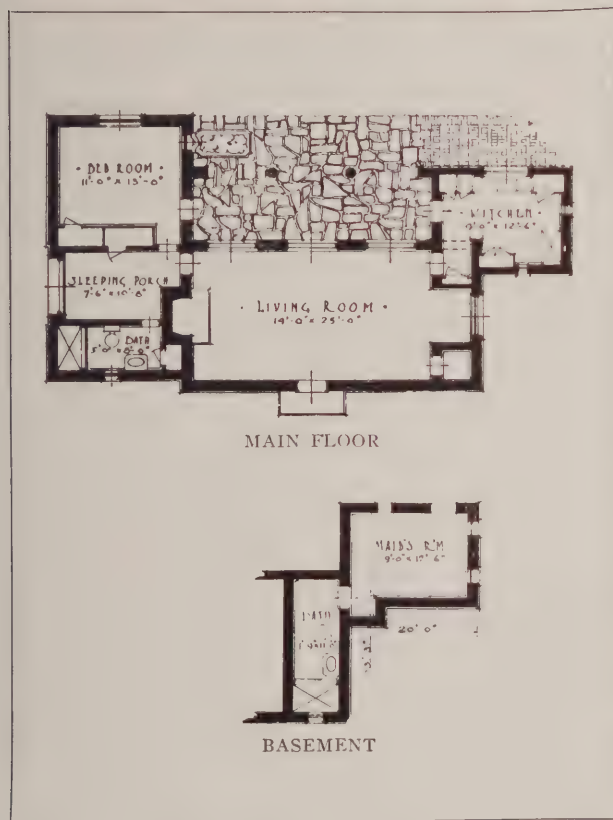


SECOND FLOOR

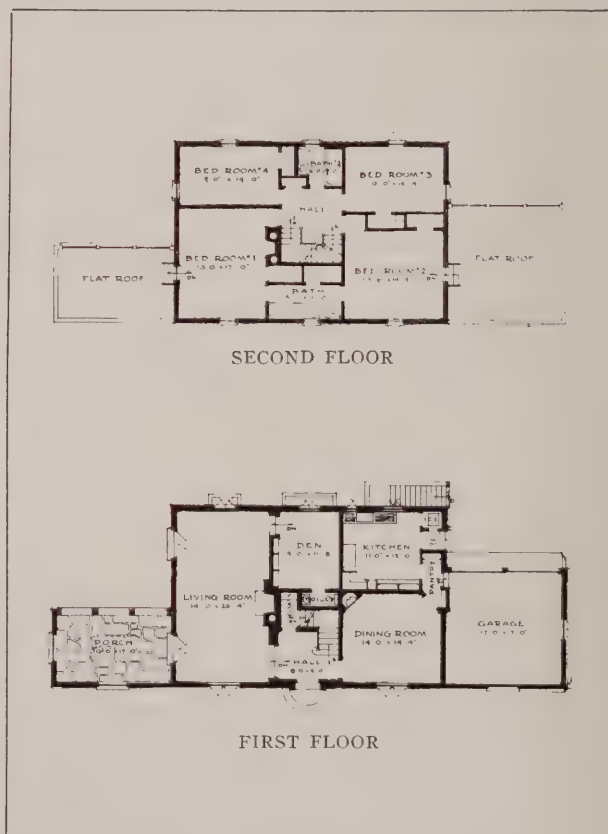


FIRST FLOOR

SECOND MENTION
SECOND COMMON BRICK HOUSE COMPETITION
BURNS & JAMES, ARCHITECTS, INDIANAPOLIS



THIRD MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 ELDRIDGE T. SPENCER, ARCHITECT, BERKELEY, CAL.



FOURTH MENTION

SECOND COMMON BRICK HOUSE COMPETITION

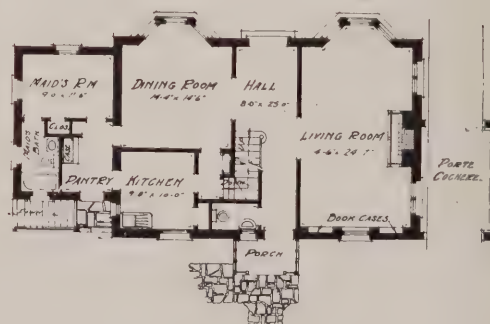
ALFRED EASTON POOR, ARCHITECT, NEW YORK



* FIFTH MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 ARTHUR L. LOVELESS, ARCHITECT, SEATTLE

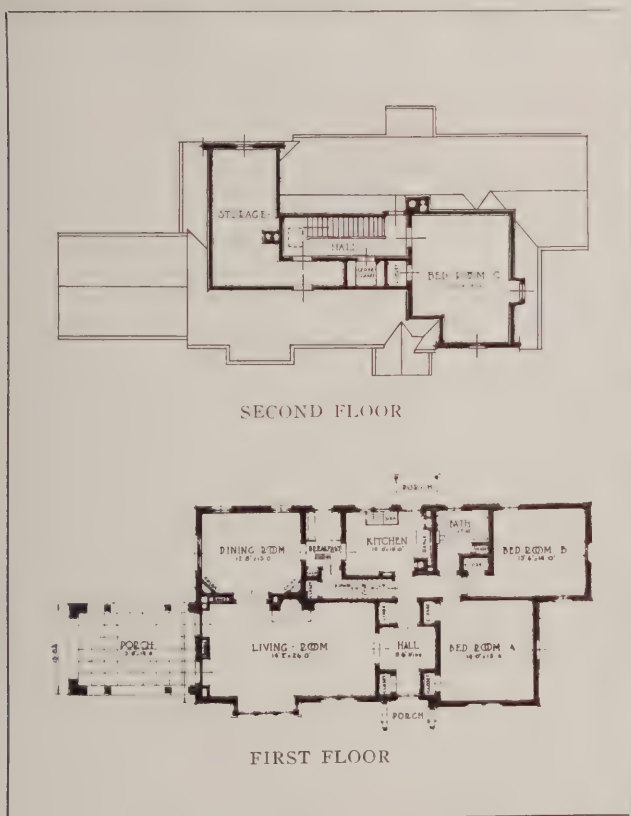


SECOND FLOOR



FIRST FLOOR

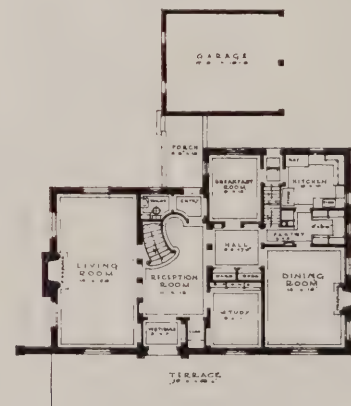
SIXTH MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 LABEAUME & KLEIN, ARCHITECTS, ST. LOUIS



SEVENTH MENTION
SECOND COMMON BRICK HOUSE COMPETITION
ROBERT MAURICE TRIMBLE, ARCHITECT, PITTSBURGH



SECOND FLOOR

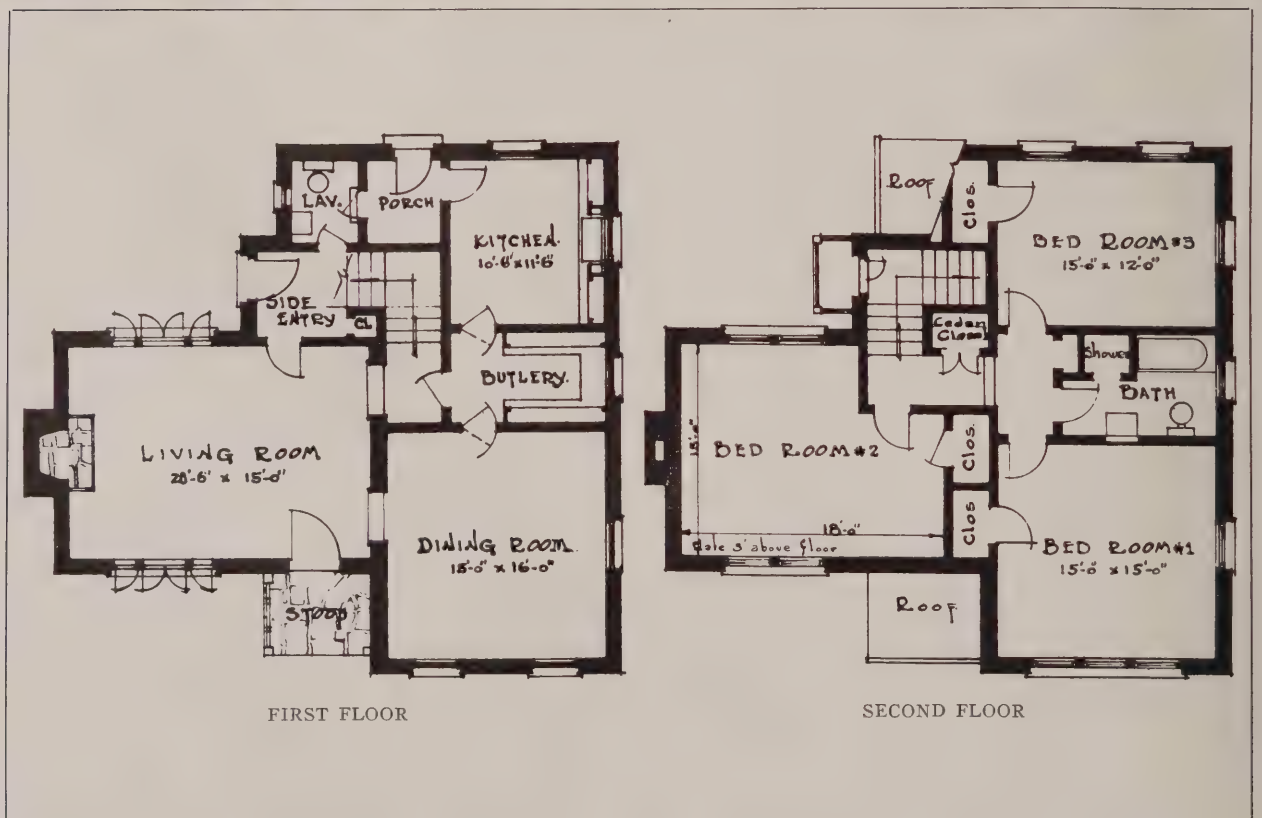


FIRST FLOOR

EIGHTH MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 LACROIX & MEMMLER, ARCHITECTS, MILWAUKEE



NINTH MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 LABEAUME & KLEIN, ARCHITECTS, ST. LOUIS



TENTH MENTION
 SECOND COMMON BRICK HOUSE COMPETITION
 WILLIAM ADDISON McELROY, ARCHITECT, HOUSTON, TEX.



SPECIAL MENTION
SECOND COMMON BRICK HOUSE COMPETITION
WILLIAM T. BRAUN, ARCHITECT, CHICAGO



SPECIAL MENTION
SECOND COMMON BRICK HOUSE COMPETITION
ROBERT O. DERRICK, ARCHITECT, DETROIT

INTERIOR ARCHITECTURE

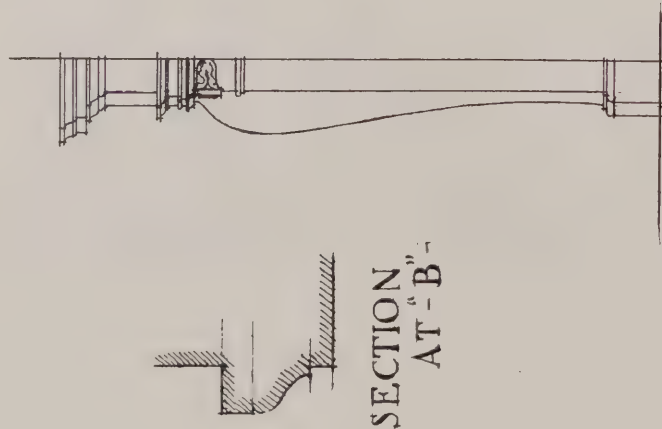
DETAILS, BOODLE'S CLUB, LONDON, PART II

Measured and Drawn by RICHARD EVERETT, JR.



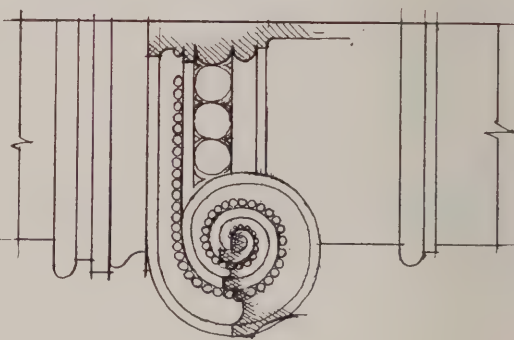
Photo. Paul J. Weber

One of the most interesting examples of the work of the brothers Adam, the front elevation shows an unusual treatment of balanced bays and a beautifully proportioned Palladian window. The omission of a continuation of the attic treatment above the center pediment is open to criticism in so small a facade

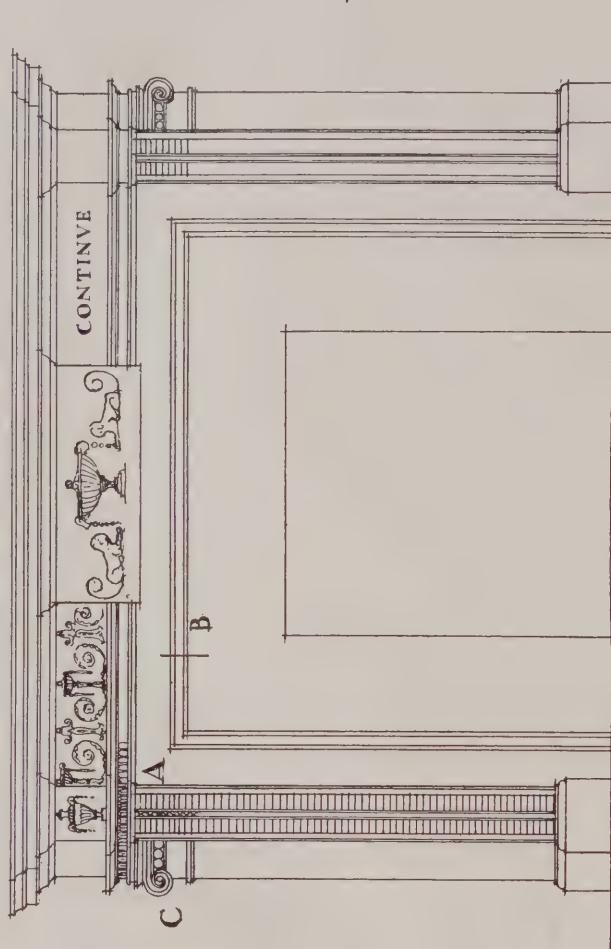


SECTION
AT "B"

SIDE ELEVATION



DETAIL AT "C"

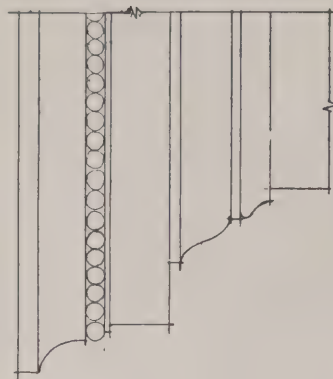
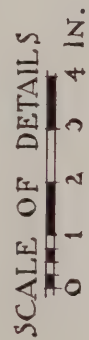


ELEVATION

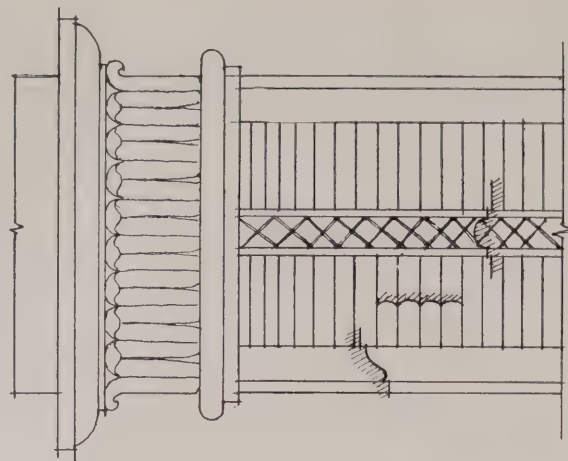


MARBLE MANTEL
IN SALON

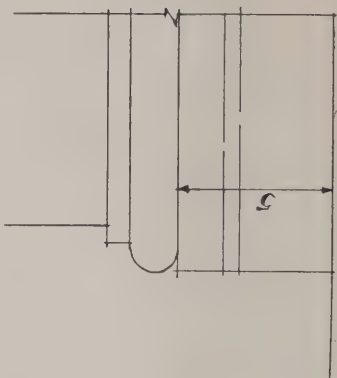
BOODLE'S CLUB
LONDON



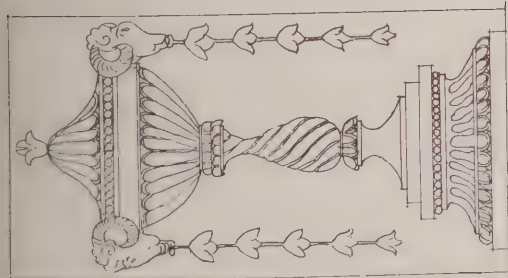
DETAIL OF CORNICE



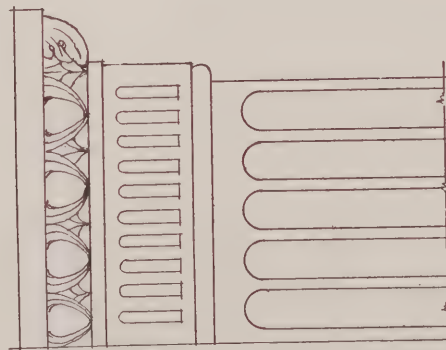
DETAIL AT "A"



DETAIL OF BASE

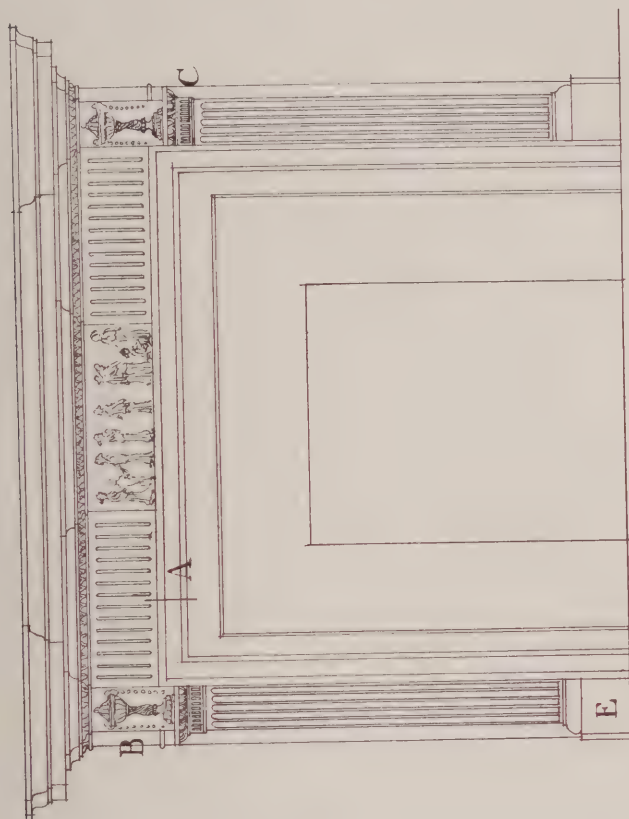


DETAIL AT "B"



DETAIL AT "C"

SCALE OF DETAILS
0 1 2 3 4 IN.



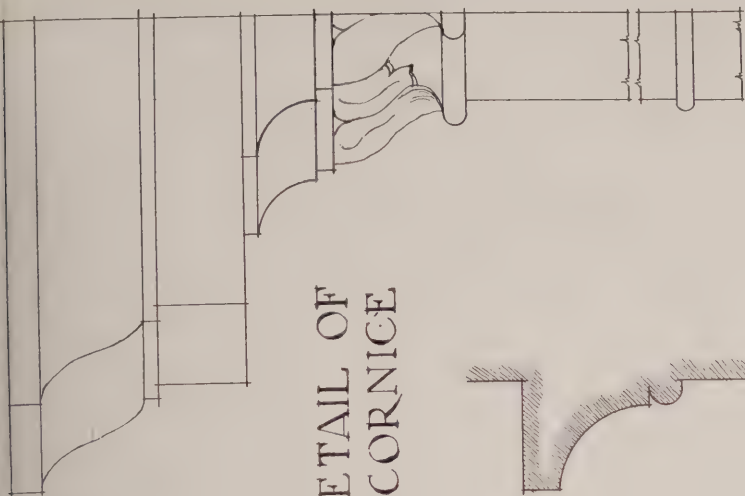
ELEVATION

SCALE
0 1 2 Ft.

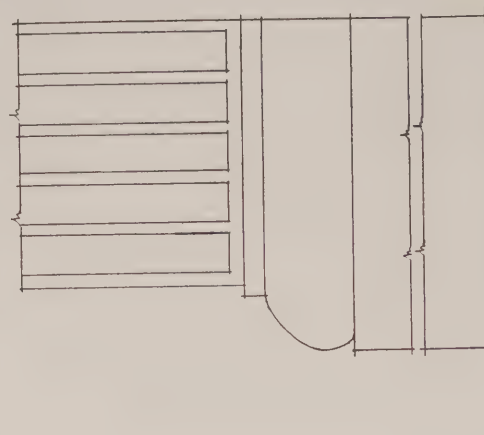
MARBLE MANTEL
IN READING ROOM

BOODLE'S CLUB
LONDON

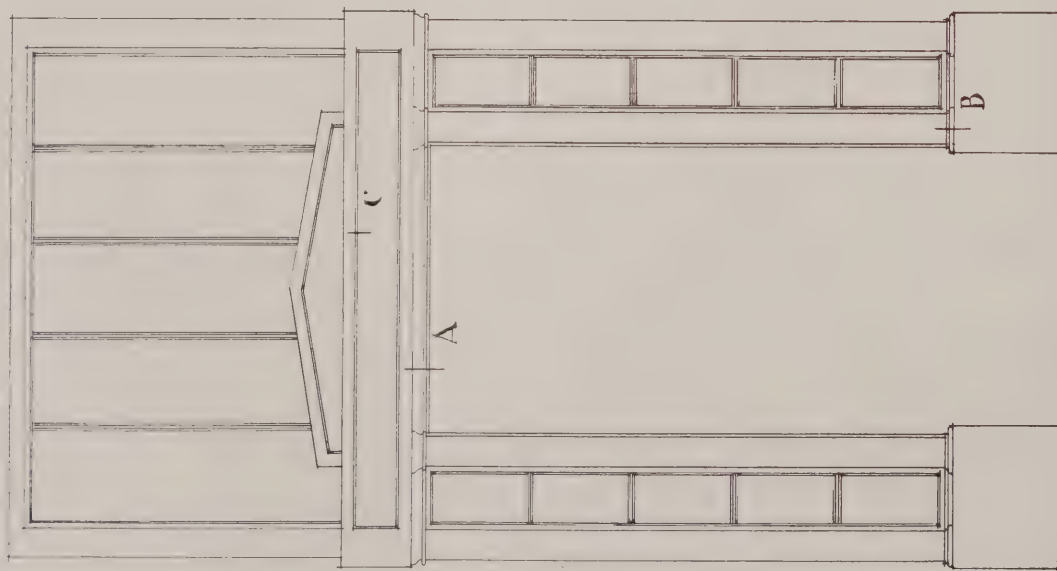
DETAIL OF
CORNICE



SECTION "A"



BASE AT "E"



ELEVATION OF WOOD SCREEN



PLAN

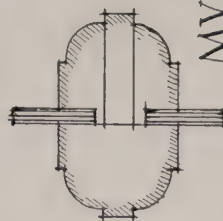
SCALE
0 1 2 Ft.



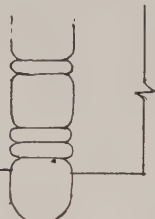
TWO DETAILS ON A DOOR
PEDIMENT



ANOTHER SCREEN



MUNTIN



DETAIL AT "A"



DETAIL
AT "B"



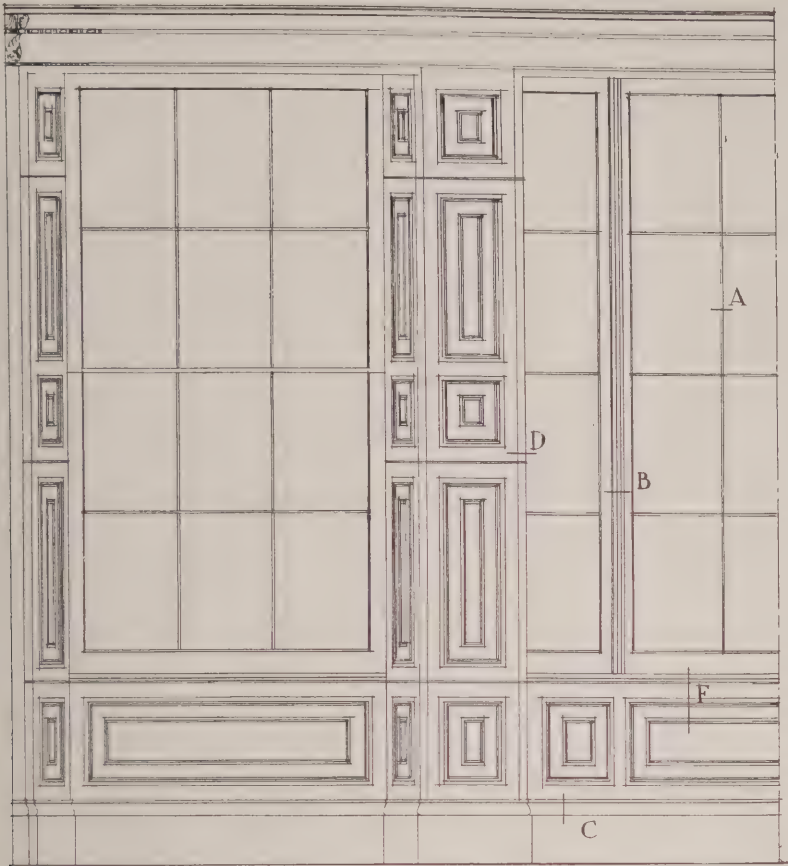
DETAIL AT "C"

BOODLE'S CLVB

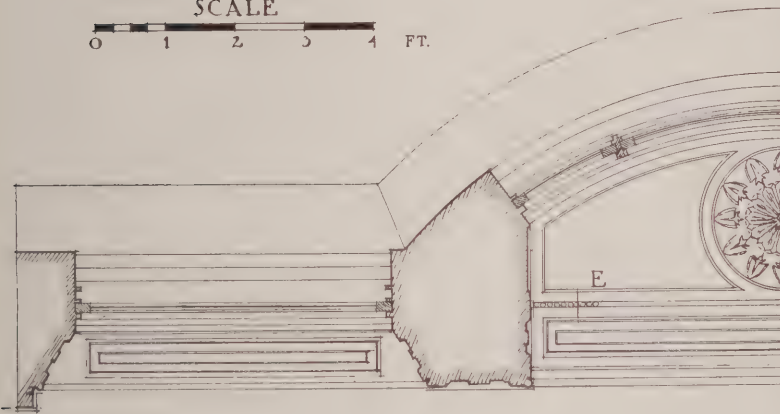
LONDON

SCALE OF DETAILS

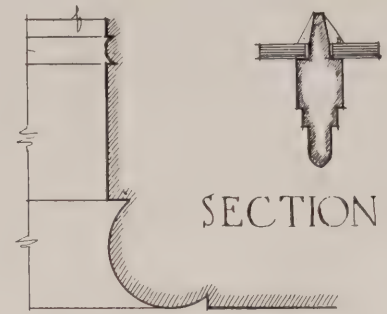
0 1 2 IN.



HALF ELEVATION

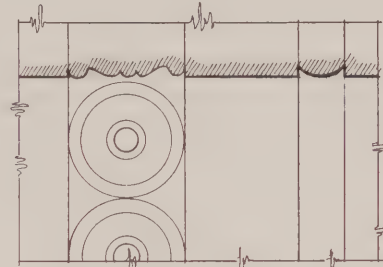


HALF PLAN

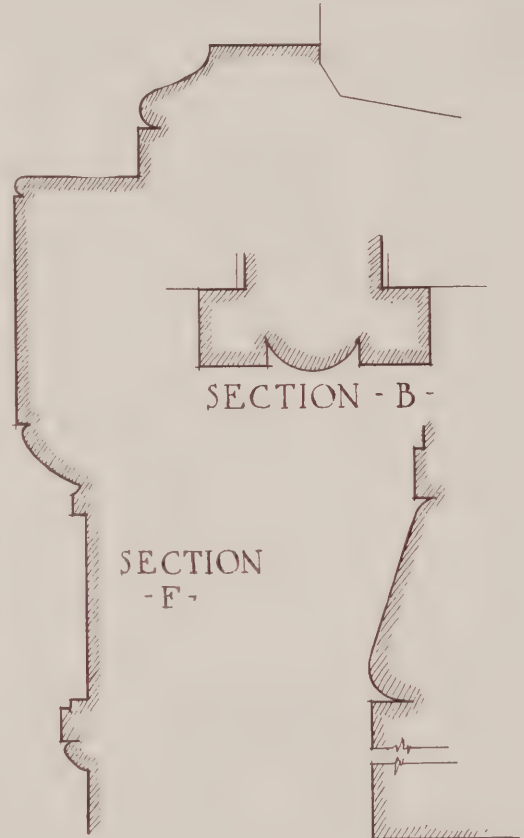


SECTION - A -

SECTION - D -



DETAIL AT - E - IN PLAN



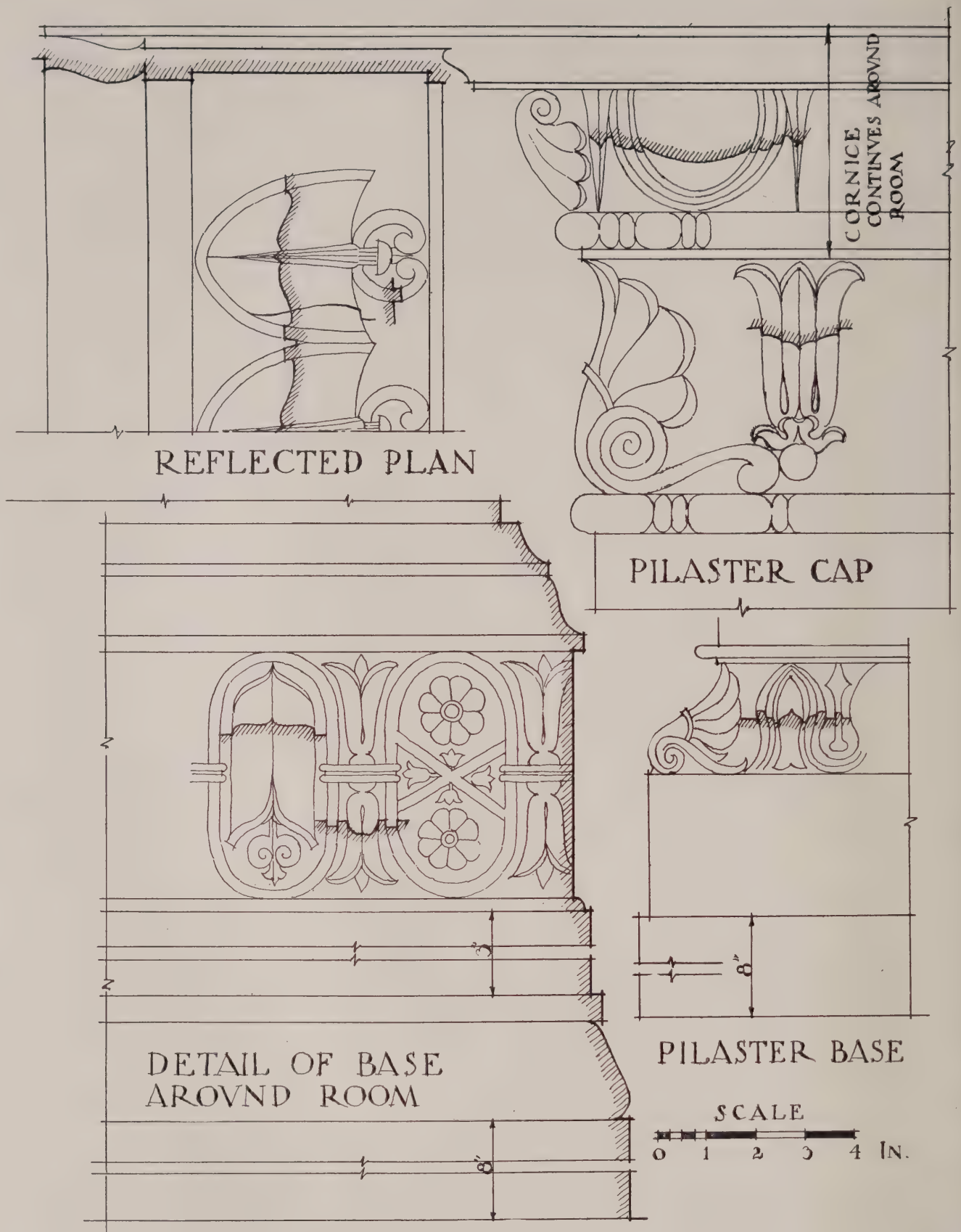
SECTION - B -

SECTION - F -

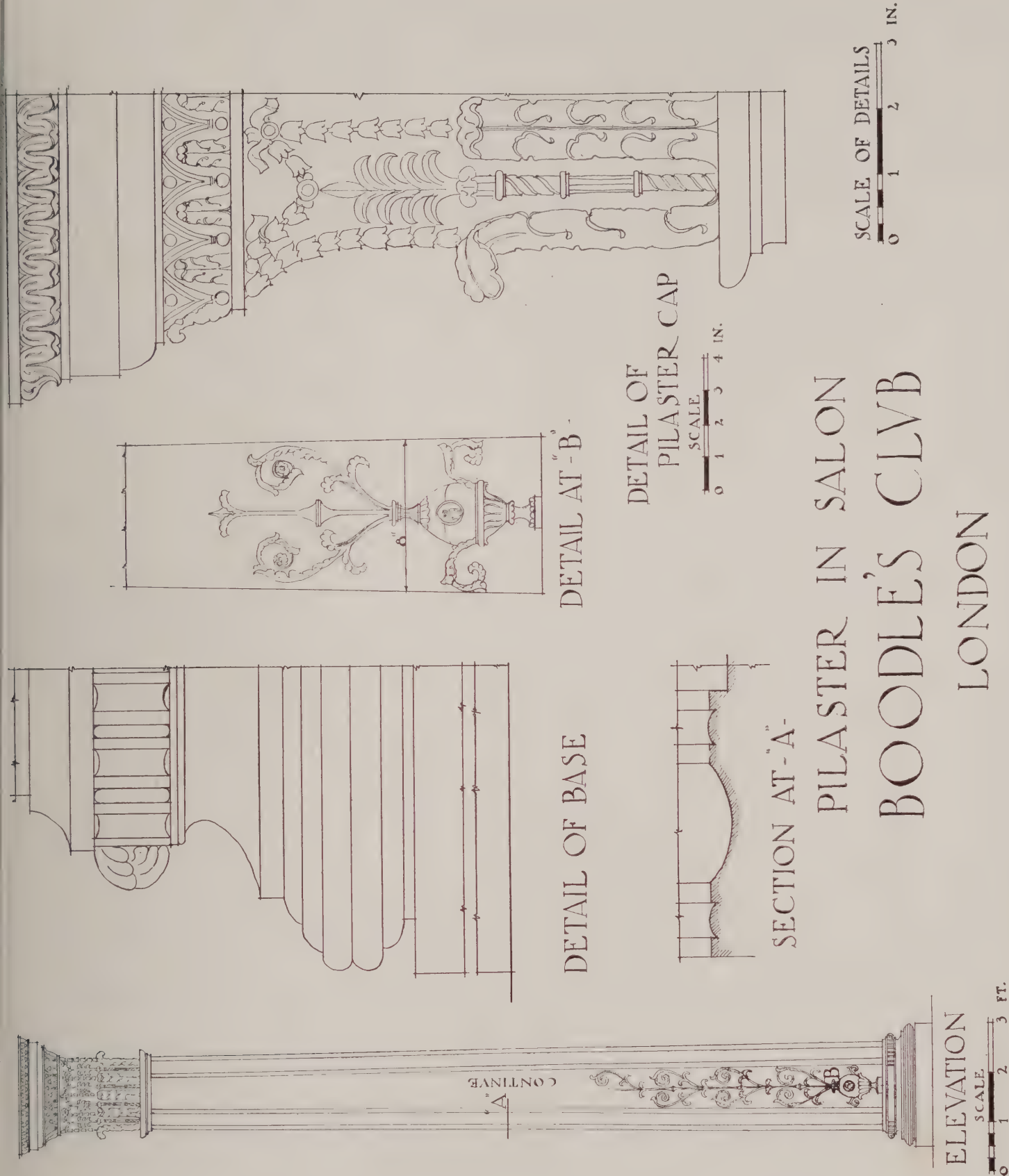
SECTION - C -

BOW WINDOW IN READING ROOM BOODLE'S CLUB LONDON





DETAILS IN READING ROOM BOODLE'S CLUB LONDON



SMALL DINING ROOM IN THE GEORGIAN STYLE



Photo. John Wallace Gillies

Walls paneled with mouldings painted mustard color contrast successfully with the blue rug, draperies, and mahogany furniture. The overmantel painting and the rich brown marble bolection fireplace moulding are antique

THE
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IN TWO PARTS

ENGINEERING
&
BUSINESS

PART TWO

JANUARY
1928



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Published Monthly by

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Robert Sweet, Sec. and Treas.; Paul W. Hayes, Asst. Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, \$7.00. Canada, \$8.00. Foreign Countries in the Postal Union, \$9.00

Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat

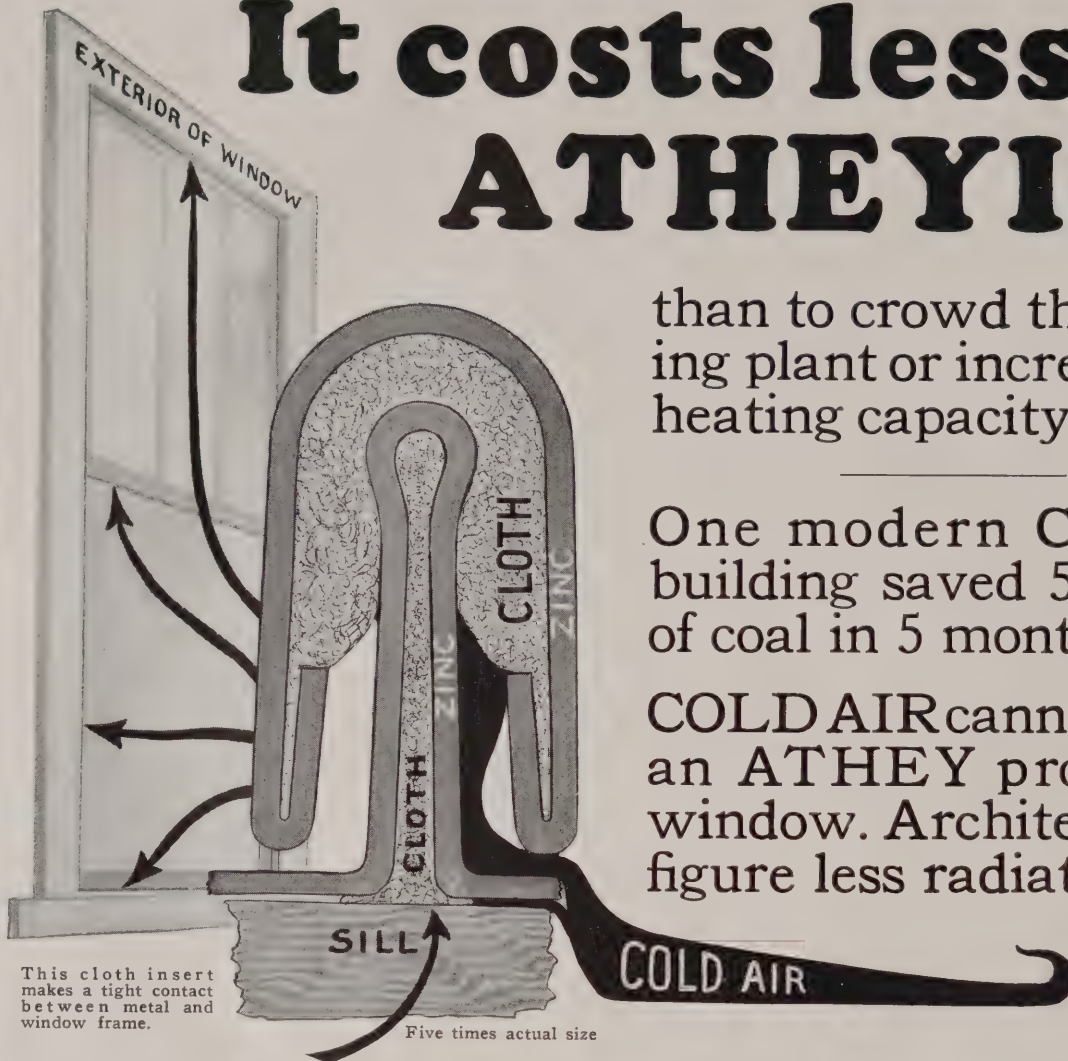
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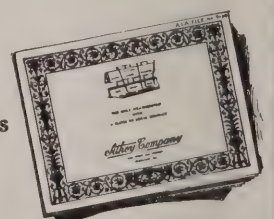
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BOOK DEPARTMENT

THE INCREASING USE OF OIL AS FUEL

THE cost of installing heating apparatus of any kind is before long exceeded by the cost of its operation. The cost of heating a building of any type by any sort of apparatus, in fact, is such that the selection of equipment may well engage the attention of both architect and client. This volume is a closely detailed study of the advantages of using oil as fuel. That these advantages are fully appreciated by the public is abundantly proved by the large number of heating installations which during the last few years have been remodeled to permit the burning of oil, the advantages being sufficiently numerous to outweigh in the minds of home owners the fact that there are some other fuels which cost considerably less.

Prepared especially for use by the heating and ventilating engineer, the heating contractor, architects, those engaged in the oil-burning industry, and for the user and potential user of oil-burning equipment, this volume contains 32 chapters covering the subject in all its phases. The treatment is such as to adapt it to the non-technical reader as well as to the man with an engineering back-

ground. There are two chapters on "Oil Fuels," with definitions, characteristics and specifications of fuels, sources, preparation and distribution, covered briefly but in sufficient detail to provide essential information on the subject. A chapter on combustion is devoted to theory, and another to practical considerations. Incorporated in the latter are a number of flame illustrations from photographs, taken especially for this volume and representing the flame characteristics of different types of burners. Two chapters are devoted to boilers for use with oil burners, one dealing in particular with the newer types that have been designed especially for use with oil.

Covering subjects that are of considerable interest to the owner is the chapter on "Warm Air Furnaces for Use With Oil Burners," in which the requirements of this form of house heating are discussed. There are four chapters devoted specifically and entirely to oil burners, one chapter dealing with types and characteristics, a second with atmospheric draft burners, and two chapters devoted to the modern mechanical draft machines. A novel

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. "Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use."



THE text of this work dwells in detail upon the working of concrete; details of construction; continuous vertical support; verticality; monolithic concrete; concrete vaulting; textures; "crazing"; and treatments; and other subjects of importance to the architect, engineer or builder concerned with concrete. It sums up and presents the experience of many successful workers in concrete construction. The volume deals with concrete and with its design as influenced or governed by its construction. Its authors have been fortunate in selecting admirable examples of the use of the material, and the work contains, among a large number of illustrations, views of residences, tall structures such as hotels, theaters, power houses, or office buildings; bridges, aqueducts, retaining walls and walls of other kinds. The views are of work in more than one country, for there are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States.

Text and 100 Plates; 8½ x 11 ins. Price \$10

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Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

method of treatment features these chapters in which the salient parts of nearly 30 of the leading oil burners are described and illustrated. "The Control of Oil Burners" is described in detail, with the modern methods of interlocking such controls with boiler, stack and other safety devices. The chapter on "Efficiency" clears up a great many misleading ideas about oil burner performance and makes it clear that several kinds of "efficiency" may be discussed profitably in selecting heating equipment.

A valuable contribution to the oil burner industry is the Iso-Oil-Consumption Chart, the use of which is described in a chapter on that subject. By means of this chart, it is possible accurately to compute the amount of oil fuel required in any building anywhere in the United States, and the work says that the many reports testifying to the accuracy of figures derived from it that have been received indicate that, as its use spreads, it is bound to be a useful contribution to the heating industry. There is an interesting chapter on the value of house insulation, one on the checking of radiation, and another on checking the heating plant installation. For the benefit of the prospective oil burner purchaser, there is a chapter on "Buying an Oil Burner," and a companion chapter on "Selling Oil Burners" which gives interesting and valuable information to the man on the opposite end of the contract. The servicing of oil burners, one of the important problems confronting the oil burner manufacturer, is replete with data and new ideas which are valuable.

HOUSE HEATING WITH OIL FUEL. Third Edition. By P. E. Fansler, 354 pp., 6½ x 9¾ ins. Price \$4. Heating and Ventilating Magazine Co., 1123 Broadway, New York.

THEORY AND ELEMENTS OF ARCHITECTURE. Volume 1, Part 1. By Robert Atkinson and Hope Bagenal. 402 pp., 7¼ x 9¾ ins. Price \$10. Robert M. McBride & Co., New York.

PROPER understanding of architecture means knowledge of its history and achievements as well as familiarity with actual building and all that construction includes. There are, of course, many excellent histories of architecture as well as many works which deal with architecture's theory and practice, but the subject is inexhaustible, and since each writer approaches the matter differently and discusses it from his own standpoint, there is abundant opportunity for the expression of as many points of view as there are authors. The world welcomes these many expressions, which develop understanding of a subject so complex and many-sided.

This volume is the first of a series by two well-known English writers and architects, Mr. Atkinson being also Director of Education in the Architectural Association, and Mr. Bagenal the Librarian of the Architectural Association. They discuss, very helpfully indeed, the history of design and construction and, particularly in various chapters, such subjects as: Climate and Building Materials; Building Stones; Walls and Wall Surfaces; Roofs; Doors and Windows; and Applications of Principles.

ELECTRIC ELEVATORS; THEIR DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE. By F. A. Annett. 477 pp., 6 x 9 ins. Price \$5. McGraw-Hill Book Company, Inc.

THE extensive use of elevators in structures of nearly all kinds and the fact that they are being operated by means of various kinds of power, present, of course, a wide field for the study of elevators. The subject is

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VOLUME I

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DEALS with all types of construction, from the simplest suburban structure of wood to the more complex fire-resistant construction of our large cities, fully illustrated and described. The work consists of 358 plates, 9x11½ ins., 381 figures and 1246 pages and includes complete working documents of executed buildings, photographic records of results accomplished, with original drawings, details and specifications by a number of well known American architects.

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Including

Acoustics of Auditoriums and
Soundproofing of Rooms

By

F. R. WATSON

Professor of Experimental Physics, University of Illinois

¶ This book covers the entire subject of Acoustics of Buildings. It describes briefly the action of sound in buildings, and, in accordance with the present knowledge of the subject, gives detailed illustrations for guidance in the acoustic design of new buildings and in the correction of acoustic defects. ¶ In this volume, mathematical formulæ and theory have been minimized, but the results of experimental tests are set forth in considerable detail. Formulæ which are needed for calculating acoustic effects are illustrated by numerical examples and curves. ¶ The publication of this book was made necessary because of the repeated requests made by architects and builders for help in the correction of acoustic difficulties found in many buildings. Information is also needed about the construction necessary to avoid these defects in new buildings. ¶ As the scientific publications on the subject deal with special topics in more or less general terms, an extensive study is required before practical applications can be made with any degree of confidence. ¶ The existing knowledge of the acoustics of buildings is incomplete in many respects, with the result that a number of misleading ideas have grown up to explain the phenomena. ¶ The book is divided into two main divisions, 'Acoustics of Auditoriums' and 'Soundproofing of Rooms.'

152 pages; 6 by 9 inches; 72 figures. Cloth,
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S t e e l I n s u r e s S t r e n g t h a n d S e c u r i t y

necessarily complex and involved, for it engages the attention not only of the architects and engineers who prescribe the use of elevators, of the contractors and workmen who install them and the operators and owners who use them, but likewise of the maintenance and repair men whose ministrations are frequently necessary for their proper upkeep. All these different points of view are considered in this recent volume by the Assistant Editor of *Power*; it is a critical study into all the different details connected with electrically-operated elevators, and in its 25 chapters every possible matter having a bearing on the subject is dwelt upon and in countless instances fully illustrated. It is a work which should be thoughtfully studied by all those interested in electrically-operated elevators, and especially by those members of architects' and engineers' staffs who are responsible for the selecting and installing of particular types of elevators.

SPECIFICATIONS FOR A HOSPITAL, Erected at West Chester, Pa. 488 pp., 8½ x 11 ins. Price \$6. The Pencil Points Press, Inc., 419 Fourth Avenue, New York.

PUBLICATIONS dealing with architecture and building and with the financing of large operations make frequent mention of the fact that those in charge of savings banks, insurance companies, and other institutions which make loans are paying more and more attention to the designing and planning of buildings which they finance as well as to the quality of the materials which enter into the structures and the equipment which fits them for their several purposes. It can readily be seen, of course, that the control of this highly important detail is in the hands of the specification writers in the offices of the architects who design and supervise construction of these buildings, but there has never been any very definite move toward what might be called the "systematizing" of specifications. Each office has been a law to itself, and the same specifications have been used over and over again, sometimes being wholly unchanged for years. Then too, during the past few years there have come into use a great number of new materials and details of equipment, many of great value, marketed by energetic sales forces, but with which even astute specification writers have not always been familiar.

This volume, the most recent of the practical and useful works issued by the Pencil Points Press, Inc., presents the specifications prepared in the office of York & Sawyer, New York, for a large hospital in Pennsylvania. "The publication of this volume is, frankly, an experiment. For a great many years it has been evident that the specification documents produced in most architects' offices have fallen far short of perfection; in fact, there seems to be a very general opinion to the effect that on the average the specifications have not been as well prepared as the drawings, and that the resulting difficulties, both on the work and often in subsequent law suits, have caused annoyance, waste of time, and loss of money.

"Many attempts have been made to prepare a comprehensive book telling all about the subject. Most of these works have never been carried beyond the stage of discussion. No adequate book on specification writing has as yet been produced, and so far as is known no progress is being made toward the production of such a work. In order that some substantial advancement may be made, there are now issued, as a contribution to the art of

specification writing, the actual specifications for various types of buildings that have been produced in leading architectural offices. It would seem that in this way opportunities for comparison and study will be open to those who prepare the specification documents which should lead eventually to a gradual improvement in specification writing. It is not expected that the specifications here presented, from the office of Messrs. York & Sawyer, will be found available for adoption as a whole, but certain parts may very well be found useful by others preparing the specifications for a hospital of any kind.

"Messrs. York & Sawyer, in permitting the publication of this specification, which they do not claim is possessed of any particular merit, are showing a commendable spirit of coöperation. They expect that this specification will be criticized and are perfectly willing to be subjected to such criticism for the good of all concerned. They will have the opportunity to examine the specifications of other architects as they are published from time to time in this series, from which they expect to improve their own specifications." The work has constructive value, and its importance should procure for it wide use.

PLASTERING PLAIN AND DECORATIVE. By William Millar. New Edition, Edited and Amplified by George P. Bankart. 345 pp., 7½ x 10 ins. Price \$15. Dodd, Mead & Co., New York.

THERE are not many materials entering into building which are more useful than plaster. It performs, in fact, many functions, for in one form it supplies the facing for exterior walls, in another form it coats or lines interior partitions, while in still another of its many and varied forms it ceases to be merely practical and useful and appears in the marvelously beautiful work the producing of which has engaged the attention of architects from antiquity down to the present.

This is a fourth edition of a work which appeared originally some 30 years ago and which ever since has been recognized as a text book on the subject. It deals with the subject of plastering in all its aspects, for though a great part of its 345 pages is occupied with a consideration of the decorative use of plaster, a large part is likewise devoted to explaining use of the ingredients of which plaster is composed, the tools, implements and processes used in its working, and the means by which there are secured those effects or results which might appear to be so simple, but which the trained plasterer knows are had only when great patience is exercised along with infinite skill guided by excellent taste. The work covers the subject plainly and fully.

ARCHITECTS' AND BUILDERS' REFERENCE BOOK. By Frank Halstead. 193 pp., 7¾ x 11 ins. \$3 Net. John Wiley & Sons, Inc., 440 Fourth Avenue, New York.

BUILDERS and contractors have been known to complain of the lack of care or perhaps the lack of practical knowledge with which building plans are drawn and building specifications written. Sometimes this is due to lack of adequate training in the technical schools, and those responsible for the training of architectural draftsmen and those who construct buildings might well exercise considerable care in choosing the text books which students use as a basis for study. While written, as its title would seem to indicate, chiefly for the guidance of architects and builders, this work might be

On selecting a protective paint

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In future issues of this magazine we will show the importance of the physical properties of protective paint pigments, and especially the difference in graphite pigments.

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studied with profit by students or by anyone concerned with correct building. The author, an architect as well as an instructor in architectural drawing at the William L. Dickinson High School, Jersey City, writes with his experience as an architect and as a teacher in view, and this work is in brief compass a complete treatise on building, dealing as it does with the actual carrying out of construction, from excavating to the installing of the wooden mouldings which often form part of interior finish or decoration. The volume is one of three which make up a recently published series, and their text as well as their carefully drawn plate illustrations gives them a highly practical value to both builders and architects.

AMERICAN THEATERS OF TODAY. By R. W. Sexton and B. F. Betts. 175 pp. 9¼ x 12½ ins. Price \$12.50 Net. The Architectural Book Publishing Co., New York.

THE complexity which has been reached by the modern theater places a heavy burden upon architecture. What is sometimes called the "legitimate drama" was simple indeed during Shakespeare's day, when its demands were often met within the courtyard of an inn, and not unduly exacting when the drama was freed of its chains at the time of the Restoration. But for generations, and perhaps particularly in America, the drama has been growing more and more complicated, more and more dependent upon accessories, "properties," and all the other adjuncts which today seem to be very nearly as important as the spoken lines, and to which adroit stage managers and resourceful purveyors of theatrical fare are paying more and more attention. To add to this there has grown up, especially during the past decade, the vast industry engaged in producing and marketing the motion picture, to serve which there have been built hundreds if not thousands of theaters. The demands of the motion picture are simple, to be sure, compared to those made by the drama proper, but none the less there must be devised a theater representing a different type.

Architecture's services have therefore been drafted into the service of the stage just as they have been enlisted by "Big Business,"—with this difference, that while the requirements of the business world are more or less static, those of the stage are in a state of such constant change that what appears to be the final, ultimate word in theaters today may be thought to be hopelessly obsolete and out of date tomorrow, try as an architect may to so plan and construct that any change required may be made without completely tearing the building to pieces. Keeping abreast of improvement is difficult. Achievements of one day are outmoded the next.

Recent achievements in planning, designing, and building theaters are recorded in this helpful and constructive volume. Theaters large and small, and theaters devoted to the exhibiting of motion pictures as well as those designed for the use of various forms of drama are included; views of exteriors and interiors are given; and in most if not all instances plans and sometimes sections are presented. Following a foreword by S. F. Rothafel ("Roxy" of the screen world), there is given a written survey of the American theater as it exists today. Every detail of designing and planning is dwelt upon,—entrances and circulation areas; auditorium, the stage with its complicated equipment and details of lighting; the equipment of the house itself; the projection room; and

all the other details which go to the making of a well planned theater. As was just said, the modern theater might be said to be constantly in a transition stage;—but this volume records its present high water mark, and as such a record it merits the attention of architects and indeed of anyone connected in any way with the theater.

ARCHITECTURAL DETAILS. By Frank Halstead. 284 pp., 7¼ x 11 ins. Price \$3.50 Net. John Wiley & Sons, Inc., New York.

TEXT books used in schools of architectural drawing and building construction quite naturally have considerable influence on the students who study them, and the training of students has its effect upon the service which they render in actual practice. Mr. Halstead, in addition to being an architect is an instructor in architectural drawing at the William L. Dickinson High School, Jersey City, and this work, as well as two other volumes which make up a series of three recently published, has been prepared with his classroom experience as a background. The scope of the work is rather larger than its title might lead one to expect, since in addition to dealing with the correct designing of windows, doors, cornices, water tables, stairs, etc., it treats of plumbing systems and the proper method of framing buildings. All this is discussed in text which is written with admirable plainness and illustrated in 114 carefully prepared plates. The volume, as well as the others of the series, is well deserving of study by draftsmen and specification writers, and indeed by anyone to whom proper designing is important. It covers its subject well.

ARCHITECTURAL DESIGN IN CONCRETE. By T. P. Bennett. Text and 100 Plates 8½ x 11 inches. Price \$10. Oxford University Press, 35 West 32nd Street, New York.

IT seems to have taken modern architects and engineers a long time to fully grasp the structural possibilities of concrete and even longer to understand the proper way of designing structures for which concrete is used. For many years it seems to have been supposed that the value of the material lay wholly in its strength, and buildings and bridges constructed of concrete, while leaving little to be desired in the way of strength and utility often fell lamentably short of realizing certain other possibilities which concrete offered to those who would use it with care and thought; and yet there are still many buildings in the world,—structures left by antiquity to the modern world,—in which concrete is well handled as regards design as well as structure. This volume, prepared in England but illustrated with halftones showing structures in other countries of Europe as well as in America, shows skillful handling of concrete, while the structural possibilities are described and illustrated in cuts of buildings of many kinds, much of the work being highly architectural, while much would seem to classify under the heading of engineering rather than of architecture. It would be difficult to decide whether the discussion of concrete on the score of design or in the matter of construction is the more important. Both aspects, however, are well covered, thus giving the volume a value to those interested in both. Several illustrations show concrete so used that the "form marks," generally regarded as disfiguring it, seem to possess a decorative character which has some value.



CONSTRUCTION, IN PROGRESS, AND COMPLETE

FROM A CAMERA STUDY BY P. A. NYHOLM

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER ONE

JANUARY 1928



INSULATION FOR RESIDENCES

BY

GORDON B. WILKES

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IN recent years the public has taken a very real and constantly increasing interest in the conservation of heat in homes. This has been due in large part to the increase in the cost of fuel for heating, to the gradual adoption of use of oil and gas-fired heaters, and to the extensive advertising campaigns of various manufacturers of insulating materials as well as to a desire for more comfortable housing. The industrial engineer has long been familiar with the savings due to efficient insulation. The almost universal custom of insulating steam pipes, boilers, furnaces, ovens, kilns, refrigerators and cold storage warehouses shows how fully this is appreciated. Perhaps it is not quite so well understood that insulation can usually be used to advantage wherever a loss of heat occurs through the walls of an enclosure.

In the case of residences, practically all of the fuel used in the heating system serves to replace the heat lost through the walls, roof, windows and doors. Proper insulation will minimize the loss of heat through the walls and roof, but of course it will not affect the loss from the windows, and weather strips or, better still, both double windows and weather-strips, should be provided. In a discussion of insulation for houses, it is always well to bear in mind the fact that windows and doors are sources of great heat loss and, consequently, that the greater the percentage area of the windows and doors the smaller will be the effect of wall and roof insulation in the saving of fuel. For example, the heat loss from a particular residence might be such that 45 per cent of the total loss is through the doors and windows, while 55 per cent is lost through the walls and roof. If excellent insulation is applied throughout, the heat loss through the walls and roof might be reduced by one-half. The total heat loss from the house, however, will not be reduced 50 per cent but only 50 per cent of the 55 per cent lost through the walls and roof, or 27.5 per cent.

In return for an investment in insulation, one can fairly assume that one will receive these advantages, the relative extent of which depends upon the type and thickness of the insulating material and also upon the relative area of windows and doors as compared with the walls and roof:

1. Saving in fuel cost of from 10 to 40 per cent.
2. Saving in size of heating system.
3. More uniform temperature distribution, with elimination of drafts.
4. A cooler house in warm weather, and particularly in the upper story.
5. Possibility of using the more expensive, but more reliable or convenient fuels, such as gas or oil, with less difference in cost.

Types of Insulation. The insulating materials generally used for house insulation may be roughly divided into four classes,—rigid boards, flexible sheets, cast, and loose materials. The rigid board type of insulation is in most common use today and is represented by such materials as cork board, fiber board, mineral or rock wool boards, and plaster boards. Cork board is made by compressing granules of pure cork into moulds and baking at a moderate temperature. No binder is required, as the natural gums of the cork itself serve this purpose. This material is generally furnished in blocks 1 foot wide, 3 feet long, and from 1 to 4 inches thick, the usual thickness for house insulation being from 1½ to 2 inches. Mineral or rock wool boards are made from slag or rock wool, felted and pressed, with or without binder, into blocks similar in dimensions to those of cork board. The fiber insulating boards are made by compressing wood, bagasse (sugar cane fiber) or other vegetable fibers, with or without binder, into large sheets approximately 4 feet wide, 8 feet long, and about ½-inch in thickness, one or two layers being commonly used in walls of dwelling houses. Wall boards of gypsum between two layers of heavy paper are also made, for insulating purposes, in large sheets similar to the fiber boards. Plaster can be applied directly to cork or fiber, thus saving some expenditure for wood or metal lath. In the case of frame houses, the insulating boards are usually applied on the inside of the studs, but they can be applied to the outside as well, if there is suitable protection from the weather. For brick, stone, tile or concrete walls, the insulating boards are applied on the inside, usually with the aid of furring strips.

The flexible types of insulation are represented by sheets made of fibrous materials, such as cattle hair, waste flax, eel grass, etc., covered with paper

or cloth. These are used as fillers between the studs in frame houses and may be applied to walls of brick, tile, stone or concrete with the aid of furring strips. Material of this type is frequently furnished in rolls, 1 yard wide and from $\frac{3}{8}$ -inch to 1 inch in thickness. There is a gypsum preparation, which when mixed with water can be poured in place, and after setting it gives a cast cellular gypsum insulation. This is between 2 and 4 inches thick as commonly installed. There are also on the market a number of materials that can be used in the form of loose powder or fibers, especially as a filler between the studs of a frame dwelling, or between attic floor joists. Typical materials are sawdust, cork dust, diatomaceous earth, mineral and rock wool, and eel grass.

Factors Determining Choice of Insulation. Some of the factors that would aid in choosing insulation are: cost of material; cost of application; weight; thickness; strength; fire resistance; vermin resistance; thermal conductivity; effect of moisture and water; permanence; decay or deterioration; settling; ability to take plaster coat; etc.

The cost of insulating materials varies so much with the different types, different localities, and with the different methods of application, that it would be of little value to attempt to give cost data. Where thin insulating boards replace the sheathing and laths, the additional cost of insulation will be very small. Where insulating material of good quality and of 2-inch thickness is applied, the cost is likely to run as high as 5 per cent of the cost of the dwelling, but fuel cost will be reduced and comfort increased.

Properties of Insulating Materials

Type of Insulation	Weight in lbs. cu. ft.	Thermal Conductivity	Fire Resistance
Rigid			
Cork	10	0.30	Slow-burning
Mineral and rock wool boards	12-20	0.3-0.5	Non-combustible
Fiber boards	12-20	0.3-0.5	Slow-burning
Plaster boards	30-60	0.8-1.5	Non-combustible
Flexible			
Eel grass between paper	5-8	0.25-0.30	Slow-burning
Cattle hair and flax fiber between paper or cloth	8-15	0.3-0.4	Slow-burning
Cast			
Cellular gypsum	12-30	0.4-0.9	Non-combustible
Loose			
Diatomaceous earth	10-30	0.3-0.5	Non-combustible
Mineral and rock wool	12-30	0.3-0.5	Non-combustible
Eel grass	5-8	0.2-0.4	Slow-burning

The coefficient of thermal conductivity in this table is expressed in B.t.u., per hour, per sq. ft., per inch of thickness, per 1° Fahr., temperature difference between the surfaces.

Calculation of Heat Losses. The effectiveness of any material used as an insulator to prevent the passage of heat depends upon a peculiar characteristic property of the material itself. Just as iron is heavy, strong and tough, and glass is heavy and brittle, and wood is light and tough, so are they possessed of another quality which unfortunately has no name quite as expressive as weight or strength or hardness, but which we call "thermal conductivity."

In a general way, materials which are soft, light, porous and fluffy are good heat insulators, and we

TABLE OF HEAT

TYPE OF INSULATION			ROOFS					
			Tile or slate on wood sheathing		Shingles, sheathing and studding		Shingles, sheathing stud, lath & plaster	
No insulation			0.82		0.35		0.30	
Cork board.....	Thickness	K.	Saving		Saving		Saving	
	1"	0.3	0.22	73%	0.16	54%	0.15	50%
	2"	0.3	0.13	84%	0.10	72%	0.10	67%
Fiber boards.....	0.5"	0.4	0.40	51%	0.24	31%	0.22	27%
	1"	0.4	0.27	67%	0.19	46%	0.17	43%
	2"	0.4	0.16	81%	0.13	63%	0.12	60%
Rock wool boards	0.3"	0.25	0.42	49%	0.24	31%	0.22	27%
	0.5"	0.25	0.31	62%	0.20	43%	0.19	37%
	0.8"	0.25	0.23	72%	0.16	54%	0.15	50%
Eel grass in paper	0.5"	0.35	0.39	53%	0.23	34%	0.21	30%
	1"	0.35	0.27	67%	0.19	46%	0.17	43%
	2"	0.35	0.16	81%	0.13	63%	0.12	60%
Cattle hair or flax	0.5"	0.35	0.39	53%	0.23	34%	0.21	30%
	1"	0.35	0.27	67%	0.19	46%	0.17	43%
	2"	0.35	0.16	81%	0.13	63%	0.12	60%
Plaster boards....	0.5"	1.0	0.59	28%	0.29	17%	0.26	13%
	1"	1.0	0.41	50%	0.17	52%	0.16	47%
	2"	1.0	0.23	72%	0.13	63%	0.12	60%
Cellular gypsum...	0.5"	0.7	0.41	50%	0.17	52%	0.16	47%
	1"	0.7	0.27	67%	0.19	46%	0.17	43%
	2"	0.7	0.16	81%	0.13	63%	0.12	60%
Mineral wool loose	0.5"	0.4	0.40	51%	0.24	31%	0.22	27%
	1"	0.4	0.27	67%	0.19	46%	0.17	43%
	2"	0.4	0.16	81%	0.13	63%	0.12	60%
Diatomaceous earth	0.5"	0.4	0.40	51%	0.24	31%	0.22	27%
	1"	0.4	0.27	67%	0.19	46%	0.17	43%
	2"	0.4	0.16	81%	0.13	63%	0.12	60%

Rate of Heat Transmission Expressed in B.t.u., per Hour, per Sq. Coefficient of Thermal Conductivity "K" Expressed in B.t.u., per Hour, per Sq.

say that they have a low thermal conductivity, or that they are poor heat conductors. Materials that are dense and heavy are usually good conductors of heat, and have what we call high thermal conductivity. The numerical index of this property is commercially called the coefficient of thermal conductivity, and it is not unusual to speak of a material as having a coefficient of thermal conductivity of 0.3, whereas common red brick have a coefficient of thermal conductivity of 5.0. Stating it even more precisely, we might say that a certain material 1 inch thick and 1 foot square has such a characteristic thermal conductivity that it would transmit 0.3 of a heat unit (British thermal unit) per hour, when the two surfaces of the sheet were 1° Fahr. apart in temperature. In the same way we might say that a layer of brick of similar dimensions would transmit 5.0 heat units per hour. It will be seen that this matter of conductivity is a characteristic of the material like light weight or color, and that it has nothing to do with the manner in which the material is used. It must be noted, however, that if heat travels through a sheet of insulating material, it must come from somewhere on one side and go somewhere on the other, and in entering and escaping from the sheet it encounters a resistance which in some cases is quite as important in delaying the passage of heat as is the conductivity of the material itself. This characteristic resistance of entry and exit depends to a great extent upon what kinds of things are in contact with both sides of the insulating sheet. If there is air upon both sides, the resistance of entry and exit may be considerable. If the sheet is enclosed with other

material of the same sort, the resistance is very small. It will be seen, therefore, that it is by no means a simple matter to compute the rate at which heat will pass through a wall of insulating material unless we know with considerable precision its nature, its thickness, and the nature of the adjacent materials.

It is to be regretted that a good deal of confusion has arisen about this matter, and that although most of the materials have been carefully tested, and there are published figures available showing the characteristic coefficient of thermal conductivity, there is also a large amount of published matter in which the coefficient of thermal conductivity and the resistance to entry and exit of the heat from the surface are somewhat confused. Much of the data obtained by using the so-called "box method" of testing materials are difficult to use intelligently because of the failure of many of the early experimenters to distinguish between the resistance offered by the material to heat traveling through it and the resistance to entry and exit of the heat under the peculiar circumstances of the particular test quoted. Recently the Insulation Advisory Committee of the National Better Business Bureau has adopted standard methods of testing in regard to insulating materials.

The "plate method" is without doubt the most precise means of measuring thermal conductivity, but the "box method" is open to considerable objection when used to compare insulating materials for dwellings. Box test data, giving "air to air" transmission values, are only applicable in these cases:

1. When the wall is composed only of insulating material, and box tests are made on the same

TRANSMISSION RATES.

WALLS									
Clapboard, sheathing, stud, lath & plaster		Clapboard, paper, stud, lath & plaster		8" brick, furring, lath & plaster		4" tile, stucco & plaster		Stucco, stud, lath & plaster	
0.28		0.31		0.27		0.40		0.45	
0.15	Saving. 46%	0.15	Saving. 52%	0.14	Saving. 48%	0.17	Saving. 58%	0.18	Saving. 60%
0.10	64%	0.10	68%	0.10	63%	0.11	73%	0.11	76%
0.21	25%	0.22	29%	0.20	26%	0.26	35%	0.29	36%
0.16	43%	0.18	43%	0.16	41%	0.20	50%	0.21	53%
0.12	57%	0.12	61%	0.12	56%	0.13	68%	0.14	69%
0.21	25%	0.23	26%	0.20	26%	0.27	33%	0.29	36%
0.18	36%	0.19	39%	0.18	33%	0.22	45%	0.24	47%
0.15	46%	0.16	49%	0.15	45%	0.18	55%	0.19	58%
0.20	29%	0.22	29%	0.20	26%	0.26	35%	0.28	38%
0.25	11%	0.27	13%	0.24	11%	0.33	18%	0.37	18%
0.15	47%	0.16	49%	0.15	45%	0.19	53%	0.20	56%
0.12	57%	0.12	61%	0.12	56%	0.13	68%	0.14	69%
0.12	57%	0.12	61%	0.12	56%	0.13	68%	0.14	69%

Ft., per 1° Fahr. Temperature Difference Between the Air on Each Side

Ft., per Inch Thickness, per 1° Fahr. Temperature Difference Between the Surfaces

thicknesses of the various insulating materials.

2. When an insulating sheet is placed in the middle of a large air space.

Both of these conditions are rarely found in actual practice. In every case the relative value of a poor insulator and a good insulator will be closer on an overall or "air to air" basis than when compared by the coefficients of thermal conductivity as found by the "plate method." If it is desirable to find the rate of heat transmission through a built-up section of insulated wall, such as clapboards, paper, sheathing, studs, cork and plaster, the "box method" is an excellent means to adopt, but I feel certain, after 17 years of almost constant experiment with both methods, that the "box method" is of very little aid to the architect as a means of determining the relative insulating value of different materials unless all the special conditions connected with the test are known. It is my opinion that one should compare relative insulating values of materials by comparing their coefficients of thermal conductivity rather than overall or "air to air" transmission values.

The effectiveness of an air space as an insulator is frequently over-estimated, especially in the case of a well insulated wall or roof. It is doubtless true that minute air spaces, properly confined, help to make excellent insulating materials, but the large air spaces found in wall and roof construction are of minor importance as regards resistance to heat flow when compared to an inch or more of a good quality of insulation.

A few typical cases will illustrate the methods used in calculating the rate of heat transfer through insulated walls and roofs. There are many tables available which will give one an idea of the rate of heat loss through uninsulated walls, and from these the loss through an uninsulated wall of a certain type can be determined.

For example, the rate of heat loss from an 8-inch brick wall with furring, lath and plaster is found to be 0.27 B.t.u., per hour, per square foot, per 1° Fahr. temperature difference between the air on the two sides. If it is desired to find the effect of three different kinds of rigid insulation, applied between the brick and the plaster, one would first determine the thickness and the coefficient of thermal conductivity of the three types from tables or from reliable data submitted by the manufacturer. The data furnished might be thus expressed:

	Thickness	Thermal Conductivity
Sample A	0.5 inch	0.30
Sample B	0.5 "	0.60
Sample C	2.0 "	0.30

Let H represent the rate of heat transfer through the uninsulated wall.

H¹=rate of heat transfer through the insulated wall.

L=equals thickness of the insulating material.

K=thermal conductivity of the insulation.

Then the rate of heat transfer through the in-

sulated wall, expressed in B.t.u. per hour, per square foot, per 1° Fahr. temperature difference between the air on each side would be equal to

$$H^1 = \frac{1}{\frac{1}{H} + \frac{L}{K}}$$

Thus with sample A

$$H^1 = \frac{1}{\frac{1}{0.27} + \frac{0.5}{0.30}} = \frac{1}{3.7 + 1.7} = 0.19$$

which represents a saving of heat loss through the wall of 30 per cent.

Similarly, sample B indicates a heat loss of 0.22 with a saving of 19 per cent, and sample C shows a heat loss of 0.096 with a saving of 63 per cent.

These savings apply to the wall, and if it is assumed that the same saving can be made by insulating the roof, and also that the loss through the windows and doors in this particular case is 45 per cent of the total loss, the actual saving of fuel would be for the three materials:

Sample A 0.30 x 0.55=17 per cent fuel saving.

Sample B 0.19 x 0.55=10 per cent fuel saving.

Sample C 0.63 x 0.55=35 per cent fuel saving.

The table included here has been assembled in order to indicate the order of magnitude of the heat loss from some typical walls and roofs when insulated by various types of materials of different thicknesses. The values for the coefficient of thermal conductivity (K) given for the different types of insulation are the average values from a great many samples submitted to the Laboratory of Heat Measurements during the past few years. The percentage of heat saved is also tabulated, and it only applies to wall or roof as the case may be and does not indicate the total percentage of heat saved for the entire building. The values taken for the heat loss through walls and roofs of uninsulated construction are average values assembled from published tables, and are necessarily somewhat uncertain, due to widely different conditions of exposure and the human factor in construction. It should always be kept in mind that as the conditions become worse, the effect of insulation is greater.

Summary. There is no longer any real excuse for not insulating a new dwelling. There is always a tendency for one to under-insulate, and I have yet to find a residence that has been over-insulated from an economic standpoint. If the percentage area of the windows and doors is not above the average, and if at the same time they are suitably protected from excessive loss of heat, I would recommend insulation that is equivalent to 2 inches of a material having a coefficient of thermal conductivity of 0.30, on the walls and roof of a dwelling where fuel prices correspond to those found in New England.

THE PROPER USE OF LACQUER

THE proved success of what is popularly known as "lacquer finish" on automobiles has created a tremendous interest in a wider application of these almost instantaneously drying materials. Research has been so stimulated among the finishing material manufacturers that developments have crowded the market to the point of confusion. People became so enthusiastic about their new automobile finish that they visualized its universal application in finishing, and have so tried it. The consequence has been varying degrees of success and failure, but there has been clearly demonstrated the need for much study, development and modification of products to meet specific conditions. Use of lacquer is decidedly not a "cure-all." Outstanding is the different performance of lacquer on a wood surface and on a metal surface. A nationally known railroad adopted lacquer for its finish. Its officials are satisfied, to date, with results on the metal parts of their steel cars, but they have been obliged to return to use of old methods on their wooden cars.

Lacquers are being specified more and more by architects, as they become familiar with the material and the causes of success or of failure in previous work. The failures have been due largely to a lack of understanding of the proper use of lacquer materials. There seems to be a need for an unprejudiced synopsis of the whole problem of the use of lacquer materials from the architect's point of view. In order to understand the essential elements of lacquer and its uses it would seem advisable to take up the subject in this order:

- A. The Advantages to be Derived from the Proper Use of Lacquer.
- B. The Disadvantages of Lacquer.
- C. What Lacquer Really Is.
- D. Considerations of the Use of Lacquer for Various Portions of the Architectural Finish.
- E. The Application of Lacquer.
- F. The Cost of Lacquer.

A. *The Advantages to be Derived from the Proper Use of Lacquer.* It will be observed that the words "proper use" have been chosen,—and with reason. The advantages to be derived from the use of the material are predicated on the specifying of the proper grade and composition of the lacquer, on the proper preparation of the surfaces to receive the lacquer, and on the proper application on these surfaces. The most distinct advantage of lacquer over other finishes is its quick-drying property. Where speed is necessary, lacquer can be used to great advantage. It is possible to apply several coats of lacquer in one day, a process that would require a week, in all probability, if paint and varnish were used. Speeding up the finishing work by using lacquer may result in the saving of a large amount of money in rentals and interest charges. In hotel work this is particularly true, as a room can be completely refinished in one day and be ready for occupancy the

next, which would be obviously impossible with the older types of finishes. The same is true of hospital rooms or wards, as refinishing with lacquer allows the least possible interruption of service. Other advantages are the smoothness on metal surfaces which lacquer naturally assumes, due to its tendency to shrink when drying. It produces a very hard and tough surface that does not mar or scratch easily, and which is readily cleaned with little effort. It does not pick up the dirt or take the "grinding in" that varnish finishes usually do, and it will imitate a wax finish without the dust-collecting tendency of the latter. Lacquer can be made more transparent than any of the usual finishes and has a distinct advantage in producing a hard, clear, waterproof film.

B. *The Disadvantages of Lacquer.* From the architect's point of view, probably the greatest disadvantage at present is that lacquer requires different handlings, and different specifications and compositions for its various uses, and it therefore requires his careful study to insure its proper use. It also demands very careful preparation of the surface to which it is to be applied and an understanding consideration of the nature and condition of this surface to receive the finish. It is more exacting in its requirements than paint or varnish. The failures of lacquer have probably been due to choosing the wrong type of lacquer for the specific purpose, or to a lack of care in the preparation of the surface, or to unskilled application of the lacquer. The properties of lacquer that are not to its advantage are its lack of elasticity, its relatively poor adhesion, its relatively small covering power, and the relatively thin film which it deposits. These disadvantages are due largely to the strong solvents which lacquer contains and its comparatively low solid content, as well as to the physical characteristics of its basic material. The solvents of lacquer will often attack oil and spirit stains, and with some lacquers only water stain is unaffected. It is not possible to obtain with lacquer the high luster of various varnishes and oil enamels. A disadvantage at present in the use of lacquer is the difficulty of obtaining artisans skilled in its application. The usual journeyman painter must unlearn a good deal of his paint and varnish technique in order to apply lacquer quickly and easily.

C. *What Lacquer Is.* The term lacquer has come to take on a new and rather definite meaning in architectural work. Lacquer as formerly understood was associated with the finishes on Chinese, Japanese and Hindu cabinet work and furniture. It was also applied to finishing materials such as shellac and spirit varnishes. There are now "flexible lacquers," of comparatively recent development, which are fast-evaporating solutions of a solid ingredient which has good building properties and retains flexibility. This ingredient may be a pre-oxidized varnish, involving a special processing of a resin and oil combination, or it may be a synthetic plastic material. In either

case, the solid is compatible with nitro-cellulose, and most of these laquers contain some nitro-cellulose as a hardener.

The term "lacquer" in the rest of this article will be limited to the nitro-cellulose base lacquer, or pyroxolin lacquer. The rather formidable word, nitro-cellulose, is merely a chemically descriptive term for the basic material of lacquers; nitrogen is combined with cellulose to form this material. The cellulose is of the same chemical nature as starch, and for the manufacture of lacquer short-fiber cotton is usually used as the cellulose content. The "cotton linters," as the short-fiber cotton is called, is that portion of the cotton left after the long fiber has been removed for the manufacture of cloth. The nitrogen is obtained from nitric acid in a process in which sulphuric acid is used to take up the water formed in the reaction of the cellulose and the nitric acid. At the completion of the elaborate process, which involves several other steps, including dehydration, the nitro-cellulose has the same appearance as bleached cotton linters. To this basic nitro-cellulose material are added solvents, gums, plasticisers, and perhaps pigments, in various proportions and of various kinds, depending on the type or purpose of the grade of lacquer being manufactured. The similarity between lacquer and varnish is easily seen by comparing the main ingredients of each:

<i>Lacquer</i>	<i>Varnish</i>
Nitro-cellulose (pyroxylin)	Linseed Oil
Gum	Gum
Solvents	Turpentine
Pigment	Pigment

The great difference is in the characteristics of the basic materials,—the pyroxylin dries hard in a short time as the volatile solvent evaporates, whereas the varnish merely "sets" as the turpentine evaporates, and the hardening is gradual as the oil oxidizes through its contact with air. The latter is therefore a two-stage process involving considerable time, the former a quick, one-stage hardening. Lacquer has not the film-building quality to the same extent as varnish, since it contains a relatively high percentage of volatile material, from about 70 per cent to 80 per cent, and a good varnish contains approximately 55 per cent. The resulting films naturally correspond to the non-volatile content which remains on hardening, and this explains why the film from a single application of lacquer is about half as thick as that from varnish.

One outstanding difference between a high content nitro-cellulose film and varnish film is that the former dries to a hard film of great tensile strength, whereas the latter dries to a more plastic, yielding film. When a lacquer film is freshly applied, a certain quantity of slow-evaporating solvents is retained in the film. These emerge gradually over a period of time, causing the film to *contract* or tighten. A fresh varnish film absorbs oxygen from the air with a consequent *increase* in weight and volume, and

continues to do so throughout its "life." We might say that the two films are opposite in their nature,—the lacquer always contracting and the varnish always expanding. This is an important consideration, as will be seen later.

D. *Architectural Uses of Lacquer.* The various considerations and conditions which the architect should understand in order that lacquer may be properly used will be mentioned here in this order:

1. Preparation of Surfaces Generally.
2. Use of Lacquer on Wood.
3. Use of Lacquer on Metal.

1. *The preparation of the surface* for lacquer finishing is an extremely important factor, a factor which in many cases determines the success or failure of the work. The surface must be absolutely dry and free from wax, grease, mineral oils, dust and dirt. The importance of this may be realized when one considers that a small piece of paraffin, if dropped into several gallons of lacquer, would ruin it by retarding its drying. Lacquer should never be used over old wax finishes nor over surfaces that have been cleaned with a paint remover or varnish remover which contains any wax.

2. *Use of Lacquer on Wood.* Lacquer makes a desirable finish for wood trim because of its hardness and its ability to stand considerable abuse without marking. The contracting tendency of lacquer has considerable effect on the appearance of the finish and its physical characteristics. When used over an unfilled open-grained wood it tends to emphasize this character of the wood as it does not fill the grain as varnish does. Lacquer lacks the filling and smoothing qualities of varnish. It will emphasize rather than correct the roughness or openness of the wood.

Close-grained woods do not offer the problem presented by open-grained woods, unless the latter are to receive an "open" or "un-filled" finish. If the wood is to be filled, it is an unfortunate circumstance that colored fillers, particularly those used on mahogany and walnut finishes, are likely to give serious difficulty. There is a tendency for the slow solvents in lacquer to settle in the pores, and over a period bleach out the coloring matter from around the pigment filler and eventually give the pores an unsightly gray or perished appearance. With many fillers this action will be pronounced in a few hours, while with others the effect, though gradual, is none the less eventually displeasing. This "graying" can be prevented only by the application of a coat of shellac or a special quick-drying insulating coat before lacquering; but if either of these methods is employed, the lacquer film is rendered tender. The alternative for this would be the specifying of a cotton base material which would do the staining and filling in a single operation. Such products are on the market, and being usable with lacquers, they produce satisfactory finishes. The drawback is their having a somewhat limited range of suitable and unaffected staining colors.

The question of stains and fillers to be used with lacquer is most important. An oil stain or spirit stain should not be used under lacquer, unless a lacquer has been thoroughly tested over the particular stain. The manufacturer should be consulted in regard to the best type of stain or filler to be used in connection with his product for the particular purpose in hand. Shellac underneath lacquer destroys its toughness and makes it tender in direct proportion to the film thickness of the shellac. It would be wrong to say that shellac should never be used under lacquer; but if it is necessary, it should be as thin a coat as possible, consistent with the particular case.

Wood expands and contracts only *across* the grain, and not *with* the grain to any extent. When wood is exposed to temperature changes, the film which is anchored to it contracts and expands in all directions, whereas the surface of the wood to which it is attached moves only in one direction. This is why "temperature" or "cold cracks" of varnish and lacquer films are always at right angles to the grain of the wood. The greatest difficulty with wood is its absorption of moisture. During a year, the moisture content of wood will vary by many per cent. It is always thirsty for moisture, and during humid periods soaks up all it can get. This results in a pronounced "swelling." The movement is *across* the grain of the wood. It is this pressure which causes what are known as "humidity cracks" in lacquer and varnish films, and is why such fractures always run directly *with* the grain of the wood. Because of their great strength, lacquer films are quite resistant to cold checking, but are very likely to fail under the far more compelling and cumulative forms of moisture swelling of wood; in fact, "humidity checking" on wood surfaces may be considered one of lacquer's greatest drawbacks. Varnish films are more yielding and plastic, and even should they fail, they often close up, as far as the eye can see, when the wood returns to a normal state. Lacquer's failures remain visible to the eye.

Exterior Woodwork. Most forms of present-day lacquer are absolutely unsuited for use on exterior woodwork or on wood surfaces exposed to moisture. The lack of flexibility of the nitro-cellulose lacquers is an inherent characteristic. All wood exposed to moisture and atmospheric changes swells and shrinks; the lacquer is not elastic enough to expand and contract with the wood, and the consequence is that the lacquer is liable to crack and peel or scale.

Floors. Due to its hardness, durability, resistance to wear and abrasive marks, good lacquer seems to be well adapted for the finishing of floors. The hardness of the finish is resistant to the constant "grinding in" of dirt to which the floor is subjected. The floor may be given a finish approximating a wax finish but which will be much easier to keep clean, as the dust remains free on the surface rather than becoming embedded in the finish.

Walls. Although walls offer the largest amount

of surface to be finished in a building, they are not always best adapted to take lacquer. It is essential that plaster walls be thoroughly dried out and "cured" before applying lacquer. That means that it is practically impossible to use lacquer on the plaster walls of new buildings to speed up such finishing. However, it can be used to advantage where speed is a requisite in refinishing walls such as those of hotel or hospital rooms so that they may be occupied without delay. Lead and oil finishes for walls may turn yellow as they age and oxidize; lacquer has no such tendency. Compared to wall paints, lacquer is perhaps more expensive because of its thinner film and poorer "covering" power. A priming coat is always desirable when lacquer is to be used on walls. Whether this primer should be of an oil base material or a special lacquer type depends on the type of lacquer to be finally used. In any case the primer must harden thoroughly before the application of the finish.

3. Use of Lacquer on Metals. Most architectural metalwork is primed at the factory before being set in place for the finishing in the building. The nature of the priming coat should be known before the correct lacquer can be specified for the finish. In any event, the surface must be clean. If lacquer is to be used on bare metal, it should be practically chemically clean to insure a good finish. If the metal is too smooth or polished there is a tendency of the lacquer to peel, due to its contracting nature and consequent lack of adhesion. It is often considered best to give metal surfaces a coat of a good oil base primer and to allow this to harden thoroughly before the lacquer is applied, especially if the lacquer is to be applied by a hand brush.

E. Application of Lacquer Materials. From a standpoint of application, lacquer is supplied in two forms,—brushing lacquer and spraying lacquer. Brushing lacquer can be applied either by hand or spray brush; spraying lacquer only by spray brush. The principal point of difference is a lack of latitude in formulation with brushing lacquer ingredients, and consequent limitations for some conditions to which a spraying lacquer may be solely adapted. It is necessary to incorporate more than double the amount of pigment in brushing lacquer than in spraying lacquer in order to secure proper "hiding" and "covering" power, and this is not always desirable. Spraying is the ideal method of applying lacquer, not only because of the speed, but because heavy protective coatings can be applied evenly. From a professional standpoint, the only reason for the use of brushing lacquer on large surfaces is the opposition of labor to the use of the spray. Brushing lacquers are more costly than spraying lacquers and often have to be formulated from the standpoint of expediency, in order to have them practical for application. Brushing lacquer must contain cotton solvents, and obviously these solvents will act on preceding coats. This fact necessitates a change in brushing methods by the painter.

Those who acquire the knack can get excellent results, and the speed of application possible reduces labor costs markedly. The successful application of a good brushing lacquer is a simple matter of spreading it on level and correcting any sags at once. Unlike oil-base materials, good brushing lacquer is self-leveling. Many of the failures with good brushing lacquer are due entirely to the mechanic who will insist on making slow and hard work out of what should be fast, easy work. He will brush out, and cross and cross and back as he has always done with oil-base materials, and get into trouble through the softening of the under coats. When brushing lacquer is specified, the proficiency of the painter who is to use it should be determined. Even an excellent brushing lacquer can cause much trouble in the hands of an unintelligent mechanic.

F. *The Cost of Lacquer.* An arbitrary statement would be that material costs of lacquer are 25 per cent higher than oil-base materials. On the average, lacquer finishing requires at least twice as much lacquer as varnish to give the same "building." To offset this there are the possibilities of faster application, with either brushing or spraying lacquers, with resultant reduction of the high labor cost factor. Another important possible saving is in the time generally lost in rigging up for the painting in a room with drop cloths, etc., and the subsequent labor in removing them to another room, while the

room already painted is drying. Using lacquer, a painter can often stay on the work until it is finished. There is also the sometimes appreciable expense for final touch-ups and clean-ups, made necessary by careless workmen marring or handling wet surfaces. Such defects can be speedily and effectively handled with lacquer, while often involving considerable labor with varnish and paint materials. The element of "time work" is another point. Bad weather may handicap the completion of varnishing and painting, whereas lacquers can be adjusted to meet the most severe conditions.

In Conclusion. The object of this article will have been attained if the architect has obtained a clearer understanding of pyroxylin lacquer, its composition, its advantages, and disadvantages, and some of the prerequisite conditions essential to its successful use. In every case when the use of lacquer is contemplated it is most advisable for the architect to consult the technical experts of the manufacturers and ascertain from their experience the proper use of the material in order that the conditions necessary for its success shall be fulfilled. It is best, if possible, to provide the manufacturer of the lacquer with a sample of the material to be lacquered so that he will know the exact conditions to be met. Success is insured by this method used by a large automobile concern which subjects samples to a 300 hour test under ultra-violet rays and alternate wetting and drying.



Cross Checks or Temperature Cracks

This is the most common failure, due to exposure to cold temperature
The cracks are at right angles to the grain of the wood



Old Age or "Crow-foot" Cracks

This is a usual form of crack, due to the film losing its elasticity
through age and the strain of wood shrinkage and expansion

STRUCTURAL STEEL FOR ORDINARY USE

BY
FRANK W. SKINNER

ONE of the most recent developments of the ordinary uses of steel is in connection with dwelling houses. During the past three years a considerable number of steel-framed dwellings have been constructed. Two types of frame have been developed, one similar in many respects to the ordinary stud and joist construction of wood, and the other with a skeleton frame analogous to that of a skyscraper. Some of these designs have been patented. Construction framing should follow the lines of simplicity and have a framing member only where a definite load is to be supported. This limitation is rapidly becoming recognized, and new designs of steel frames are becoming more simple and direct than their predecessors. The weight of steel involved is being reduced without affecting in any essential the necessary strength of the structure.

The greatest advantages of the dwelling house steel frame include the elimination of shrinking, warping, decaying, and sudden failure under excess loads. It is incombustible and adds nothing to the fire hazard. It must, however, be protected from temperatures exceeding 600° Fahr. and from moisture. Such a frame can be so designed by competent engineers as to resist cyclones and earthquakes. When combined with suitable floors, walls, roofs, stairs and partitions, it becomes an essential part of an incombustible house. The designing of the steel frame is properly the work of the structural engineer, and that of the floors, walls, roof and partitions is the work of the architect. That designs have not been uniformly satisfactory is no fault of the steel as such, but has often been because of a lack of proper coördination of the various parts. Some designers of these houses have given too much attention to the steelwork in devising a complicated scheme without giving sufficient attention to the other quite as important elements of the structure.

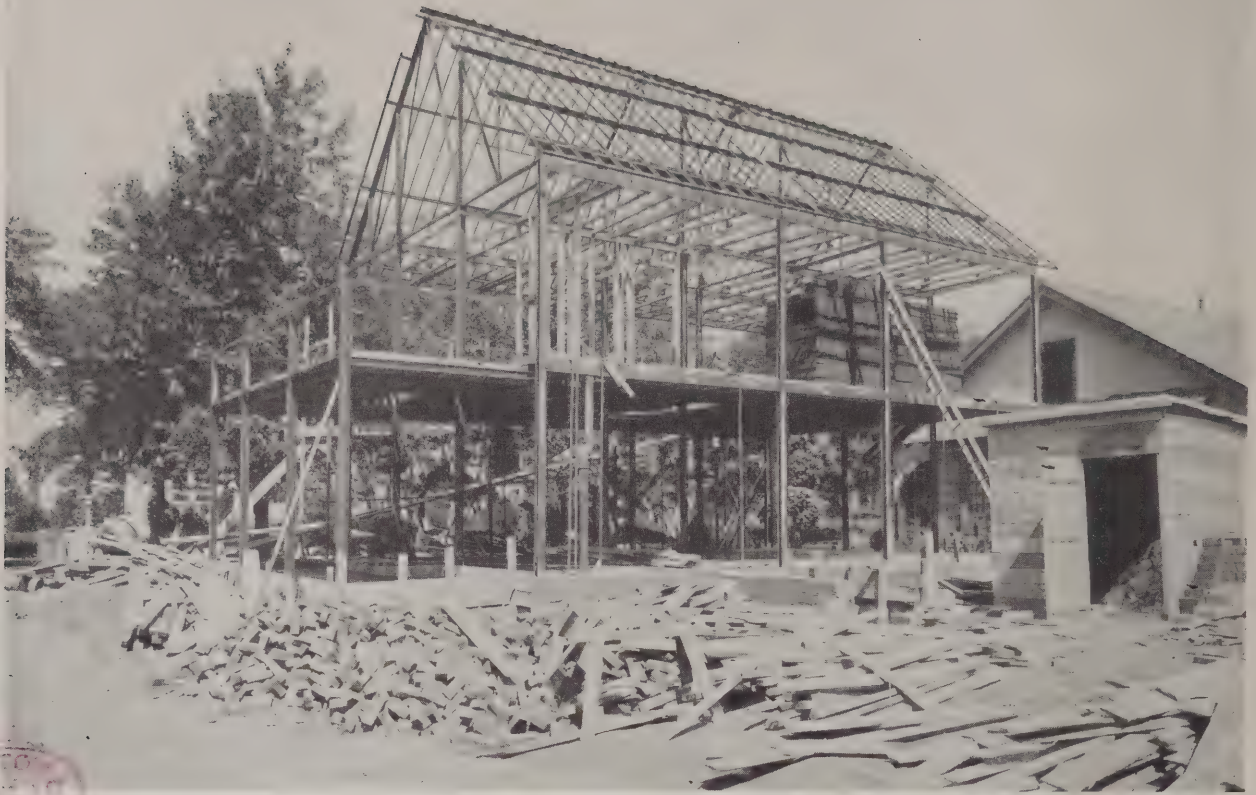
In this connection, it may be well to mention some communities built up of very costly, inflammable dwellings on which the owners cannot procure fire insurance. If brick houses have incombustible floors, partitions, roofs, stairs and interior doors, a fire could be confined to its place of origin without damage to the other rooms. This can be accomplished by the use of structural steel joists, girders, rafters and partition studs. Too little attention has been given to the use of steel for this purpose. The steel-framed designs so far made have been for medium-priced homes rather than for mansions. Steel is, however, appropriate for nearly all classes of dwellings, and its cost is not excessive compared with that of first grade materials which it displaces. Fire-resisting floor, partition and roof construction is procurable in a great many forms with which the architect is familiar. Because of competition be-

tween the producers of the various materials used, the cost of incombustible construction does not exceed that of any other first class construction. Much time and experimentation have been given to and money expended in developing steel-framed dwellings. They are a well demonstrated possibility, and the promise is that their use will increase rapidly.

Structural steel is one of the most important of the materials used in the construction industry, of which buildings constitute the major portion of the \$6,000,000,000 annual cost. In fact, it was the making of structural steel as a commercial commodity that gave the construction industry an impetus that has not yet shown any signs of losing its force. Improvement in building materials and methods of construction shows no signs of abatement, and through it all structural steel holds its unique position of unlimited adaptability within the construction field. Steel has also maintained its place as the standard for comparison of structural materials for certain major uses, because of four characteristics: (1) It is the only commercially available material, except certain kinds of wood, that has large and reliable resistance to tension and compression stresses. It also has high resistance to flexure and shear, thus providing unapproached universal strength of the greatest practical and economic value. (2) It has the greatest strength for a given measure of weight. (3) It has the greatest strength for a given volume. (4) Its quality is uniform. This cannot be said of other materials, and it is not to their discredit, since they all have certain characteristics that make them very valuable.

All structural materials have their natural limitations of strength and durability, and in selecting them these limitations should be considered. The safe strength limitations of structural steel are given in the various handbooks published by the manufacturers. These data are in the form of tables which are easily understood and are sufficient for ordinary use in connection with standard connection details and bearing plates. Intricacies of designing are found in skyscrapers, involving wind stresses and in specially loaded structures, which require the expert consideration of structural engineers. Other limitations of steel concern the property of durability.

Structural steel will corrode when exposed to moist air and water. To prevent corrosion, protective coatings of paint are applied, and these paints must have certain qualities to be effective. There are few if any protections for steel that are equal or superior to the best paints when they are adequately maintained, as many other coverings are absorptive and permit the access of water to the steel. It should be remembered that, except some granites and burnt clay products, all other struc-



Steel Frame for Six-Room House, Port Washington, N. Y.
John England, Jr., Architect

tural materials suffer from the destructive attacks of water and oxygen, especially in combination with frost. Frost does not seriously affect properly designed steel. The strength of steel is affected by high temperatures. Steel is practically incombustible, but at temperatures exceeding 1000° Fahr. it loses its strength. In order to protect structural steel from the destructive effects of high temperatures, various protective encasements known as fire-proofing have been invented. The use of these fire-proofing coverings is regulated by building codes. No structural material, except certain burnt clay products, is immune from the action of high temperatures.

The adaptability of structural steel is practically unlimited. This is recognized in the design of important structures such as skyscrapers, commercial and industrial buildings, and bridges. Notwithstanding this knowledge, we are too likely to overlook the advantages of structural steel for ordinary uses. Structural steel can be adapted to a multitude of specific uses with the greatest facility. It is manufactured in the shape of I-beams, H-beams, channel beams, angles and other convenient shapes. Each of these shapes is made in a wide range of sizes and weights, providing for almost every strength requirement. When the strength limitation of any single action is exceeded, a compound shape is made by assembling and riveting simple sections and plates. Many of the standard shapes are suitable as manufactured for use as beams and girders without

any special fabrication except very simple and inexpensive shopwork to make them ready for columns and other purposes. I-beams and H-beams are used as single pieces of any required length, available as rolled, with no shopwork, or with only minimum punching and riveting for connections. When the loads and dimensions are determined, these units may be selected safely, by inspection, from the tables, and can be easily erected by any intelligent builder with a derrick, bolts and wrenches.

For ordinary small building construction, field connections need not be riveted but can be securely bolted, insuring safe and rapid erection. Beams should be connected to other beams, girders or columns by bolts or rivets through standard connection angles attached to their webs, and generally they should not be seated on the top or bottom flanges of other beams or girders. Where they take bearing on or in walls, they should be seated on standard-size flat plates large enough to distribute their loads safely over the masonry. If the ends of the beams or girders rest on masonry walls, one or both ends should be anchored to them by vertical bolts passing through bearing plates or, as is more commonly done, with U-bar anchors. Columns carrying heavy loads should have special bearings distributing their loads over the masonry piers, usually by a set of short I-beams bolted together and embedded in concrete. Light columns, such as are composed of single H-beams or their equivalent, have angle



Steel Frame, House of Frank G. Clark, Baton Rouge, La.

flanges riveted to their lower ends and seated on loose thick plates accurately bedded at the proper elevations on the pier and connected to it with vertical anchor bolts passing through the angle flanges.

In selecting long beams and girders, great care should be taken that their deflection is not too great, irrespective of their actual strength. Too much deflection, even when there is no danger of failure, will crack the plaster and masonry, damage decorations and derange delicate machinery. It is also likely to increase existing vibration. Steel should be hoisted with rope-slings,—never with chains,—carefully adjusted so that they support the centers of gravity and cannot slip, or with hooks and clamps securely fixed in position; and it should be supported by them until at least half of all of the open holes in their field connections are filled with bolts, the remainder being put in and screwed tight as quickly as possible. After all connection bolts have been adjusted a second time to test their continued tightness, their nuts should be securely locked in place by cutting into the engaged threads with a pointed chisel. This secures them against accidental loosening, but they can be released by a powerful wrench without serious injury to the bolts. Care should be taken to have connection bolts of the correct lengths, so as to project from $\frac{1}{8}$ - to $\frac{1}{2}$ -inch beyond the tightened nuts to make them secure.

Steel columns must be kept perfectly plumb, and if there are spliced joints between column sections,

they must have perfect bearings throughout. Until the entire framework is completely assembled and permanently bolted or riveted together, great care must be taken to keep it braced or guyed to prevent swaying or buckling and to make it all act together, so that no portion can fail alone. Beams and girders must have effective permanent lateral bracing. Planks, cement, bricks, tiles and other heavy material should never be stored on a floor supported by steel beams and girders until that portion of the floor and framework is entirely completed and all field connections fully bolted or riveted; even then care should be taken that the load does not exceed the capacity of the floor. Buildings before completion should be thoroughly X-braced or guyed against possible high winds, which have wrecked them before the walls, floors and roofs, which add greatly to their stability, were completed. During erection, derricks, hoisting engines and other heavy equipment should never be placed on steel beams or girders excepting under proper authority and inspection. Ropes and tackles should not be connected to the steel framework without permission. Special care must be taken to avoid improper connections of guy lines to members of the steel framework. It must be remembered that the safe strengths of the angle iron connections given in the handbooks are based on the use of rivets. Bolts are naturally less strong, as they do not fit as closely, and the load is not as likely to be evenly distributed on all of the

bolts. Care must be exercised in computing the probable loads to be supported by the steelwork, and if there is any probability that they may be exceeded, additional bolts must be provided. These are considerations in bolted steel construction.

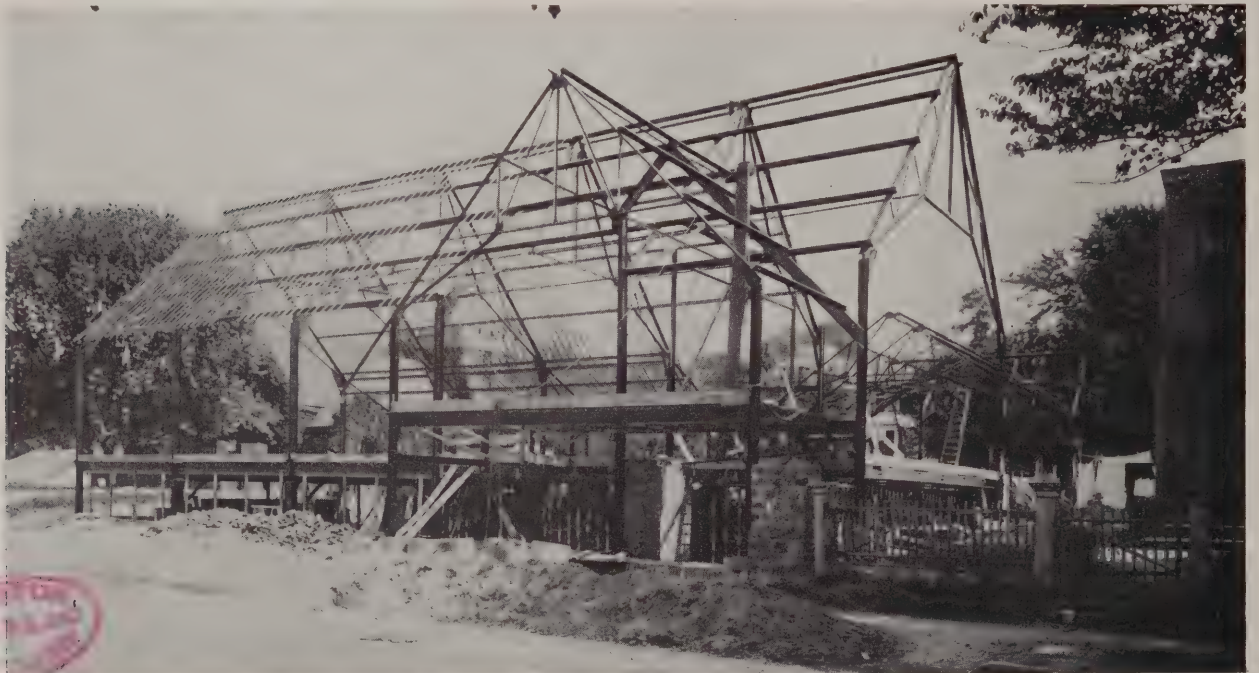
Steel should not be accepted unless it is clean and free from rust. Steel enclosed in masonry or concrete should be thoroughly "parged," that is, covered with a thick coating of rich cement mortar, around which the mortar or concrete of the walls is well flushed as the masonry is built. If the brick or concrete encasement is exposed to the weather or water, the steel must be thoroughly protected by a non-oil paint, as concrete and bricks admit the passage of water. All concave, enclosed, or horizontal surfaces should be permanently drained, and all pockets and narrow clearances likely to collect or retain dirt or any form of moisture should be, if practical, filled solid with cement mortar, or otherwise frequently inspected, cleaned and repainted.

If any combustible material is used in construction or is stored or installed in buildings, the structural steel should be thoroughly fireproofed with a solid casing of concrete in contact with its surface and not enclosing an air space around the steel. If columns or other members are enclosed in brick, terra cotta or tile, the spaces between the steel and the casing should be filled solid with mortar. If the interior of the building does not contain combustible contents and is kept dry and warm, and if there is no smoke, steam, acid or liquid in contact with the steel, it may need no protection other than the ordinary ornamental painting. If the steel is likely to be exposed to smoke, acid fumes, cooking fumes, steam, drippings from wet ashes, or from brine or

other sources of moisture, it should be accessible for observation, cleaning and protection, and in these cases it should not be enclosed permanently but should be thoroughly painted and frequently inspected. As long as the paint remains uninjured and effective, the steel will be in good condition. In all cases the design and maintenance must be such that steel can be kept clean and dry and not corrode.

Great improvements in steel making and in rolling mill practice have now made it possible to obtain standard I-beam and H-beam sections with depths of from 3 to 30 inches, flange widths of from $2\frac{1}{3}$ to 16 inches, and weights of from 6 to 300 pounds per linear foot, thus making very desirable one-piece sections for columns, beams, girders, purlins, and lintels for all but extremely heavy service. They can be rolled of almost any length and can be shipped in carload lengths up to 60 feet, or more in special cases. Special I-beams with thin webs and flanges are now available for very light roof and floor construction. For one-story lengths, where loads can be applied directly on top, steel pipes are frequently very satisfactory and economical as columns, and should have faced ends and caps or screwed top and bottom bearing flanges.

There are several excellent types of patented steel roofs, floors and ceilings, the details of which have been carefully worked out, that can be commercially obtained. There are also several firms that manufacture standard, interchangeable framework for steel buildings that can be quickly delivered and erected. They are useful chiefly for industrial shops and warehouses, or for garages and the like. Steel windows, doors, frames and sash are also available, and their use is desirable.



Steel Work, St. Stephen's Church, Port Washington, N. Y.

John England, Jr., Architect

PRINCIPLES OF ECONOMICAL PLUMBING LAYOUTS

BY

MILFORD B. SQUIRE

OF THE OFFICE OF McKIM, MEAD & WHITE

IN using the word "economical" in the title, we may consider its meaning from two conflicting points of view. We may mean in one instance economy in first cost and in another instance economy of maintenance. It is usual to find that the materials which would reduce the first cost are those which have the shortest life and which increase maintenance and repair costs, even to the extent of making necessary extensive replacements. There is an adage, "the best is always the cheapest," to which I heartily subscribe. On the other hand, "moderation in everything," is equally applicable. It would be obviously unwise to specify the best and most lasting materials for a temporary structure, but it seems to me no less wise to specify materials the life of which is known to be less than the expected life of the building. If this latter course is pursued, it will be found that the replacement costs, especially labor costs, will considerably exceed that of a first class installation at the beginning.

In striving for economy in the plumbing expense of a project there is often a temptation to choose a cheap contractor. While such a choice may result in lowering installation cost, it often has the effect of raising the maintenance, repair and replacement costs. Eternal vigilance on the part of the architect in supervision is the price he must pay for selecting the so-called "cheap" contractor. The plumbing is often concealed as quickly as possible under these circumstances, and the quality of both the material and of the workmanship must be carefully watched. There is a natural and very human tendency on the part of the contractor to save himself expense in order to increase his profit, and this may work to the detriment of the quality of his work. It is well to be suspicious of a bid from a plumbing contractor that is much lower than that of others bidding on this work. It is probable that he has made a mistake in estimating, or that he has discovered loopholes or loose phraseology in the specifications, of which he intends to take every advantage. It seems that there is greater economy in the long run when only a few plumbing contractors, whose reliability and integrity are assured, are allowed to bid on the work. It must be remembered that in most instances "you get what you pay for," and that you cannot expect high class work at a cheap price. "One cannot make a silk purse of a sow's ear," and no matter how willing the plumbing contractor may be to live up to his contract, he cannot produce good work unless he uses good materials and employs skilled men in making the installation.

There are two factors to be considered in planning the plumbing layout to make it economical. The first factor is that of simple, direct arrange-

ment of pipes and fixtures so that the smallest possible amount of material will be required to function properly. The second is that of the proper choice of materials to obviate the necessity of repairs and replacement, to say nothing of the annoyance and dissatisfaction caused by a plumbing system out of order. It is often possible to so plan the plumbing system using the best materials that there will be no greater initial cost to the owner than for a poorly planned system using the cheapest material. The saving in the quantity of material by proper planning will often make up the difference in cost over an improperly designed system using low quality materials. The architect's problem is therefore more one of economy in length of pipe and simplicity in arrangement than one of choosing the material of lowest first cost. The latter procedure will in almost every instance make the plumbing system expensive rather than economical in the long run.

It has been the practice in many offices to indicate the locations of fixtures on the plans without due regard for economy of installation costs. In many instances the plan indications have not been accompanied by plumbing sections or diagrams, and the plumbing contractor has been left to his own devices in installing the system,—and the devices are many and devious, as architects and their clients have learned to their sorrow. The disregard of structural requirements on the part of some plumbing mechanics must be seen to be appreciated. If the architect took the time to make a plumbing section of the proposed installation of fixtures as indicated on his plans, the deficiency or efficiency of the arrangement would be quickly and clearly demonstrated. It is probable that changes could be made in the locations of fixtures that would reduce the amount of pipe required. In this connection it is always wise to employ an expert as consultant if expert engineering services are not available in the architect's own office. In many instances the savings made in following the rearrangements suggested by the consulting engineer have more than paid for his service as well as produced a salutary effect on the client by giving him a more efficient plumbing installation. A plumbing layout or a plumbing section should form a necessary part of every set of working drawings emanating from an architect's office. The care with which this plumbing layout is made, and the intelligence and knowledge used in its making, determine the economy of the installation. Even in small house work, the best price can be obtained from plumbing contractors by including a plumbing section so that each bidder will know exactly what will be required of him, to say nothing of having a more definite assurance that

the plumbing installation will be really efficient.

It is my object to point out in this article several economies possible in planning plumbing systems. The first principle of economy in planning a plumbing layout is that of simplicity. Naturally, the simpler the system the fewer the parts to get out of order, the greater the ease of installation, and the greater the accessibility for repair or cleaning should the necessity arise. Simplicity can be attained in the plumbing system only by making an accurate plumbing section and revising it to eliminate every joint and offset possible. Directness may be considered a corollary of simplicity. By an analysis of the plumbing section, all unnecessary turns and changes in direction of the pipes can be eliminated. The architect must realize that each joint in the plumbing section means a corresponding amount of labor cost,—the labor of cutting the pipe, the labor of installing the pipe,—and the cost of making the joints,—as well as the cost of the necessary fittings.

It is necessary in designing an economical plumbing system to make all horizontal runs as short as possible. This not only decreases the cost but actually makes the system more efficient. It has been found best to locate water closets close to soil-stacks and if possible to group the other fixtures near them. The fixtures should be so located as to obviate the possibility of their freezing. As a rule this can be done by making sure that no plumbing lines are run in the outside walls or outside ceilings where they will be exposed to large temperature changes. If it is absolutely necessary that they be in such places, it is poor economy to try to save a few dollars by omitting insulating covering from the pipes. The head of the tub and the lavatory should be close together, and both of these near the water risers and the stack, otherwise there is a needless amount of piping. This can easily be accomplished by thoughtful planning. The United States Department of Commerce Bureau of Standards has carried on an extensive investigation of the possibilities of improving the plumbing systems of small dwellings and has published the results in a booklet called "Recommended Minimum Requirements for Plumbing in Dwellings and Similar Buildings," which may be obtained for 35 cents from the Superintendent of Documents, Government Printing Office, Washington. The investigation was conducted by making actual installations of plumbing fixtures, using various systems and various arrangements. In this way very real and practical results were obtained. The results of these tests indicate very strongly that these features, among others, are essential to an efficient, economical plumbing system:

1. Simplicity of design.
2. Grouping fixtures about the stack.
3. Short horizontal runs.
4. The provision of adequate water supply.
5. The provision of proper back-venting.

To the architect in search of concrete examples of efficient and economical arrangements of fixtures

and pipes, this booklet gives diagrams and instructive explanations. Some of the diagrams are not as well drawn as might be desired, but the architect will find in them very definite arrangements, and illustrations embodying the correct principles of economical plumbing. It must be borne in mind that in every case the local plumbing code or ordinance must be consulted to make sure that it is not violated by a plumbing layout derived from this source. Many such codes are not based on scientific investigation or the best current practice, but they must be complied with, nevertheless. One code may prohibit the main house-trap because of its system of sewage, and the code of another locality may make the inclusion of the house-trap mandatory. For the sake of economy it is best to consult the local code to make sure that the plumbing system will not have to be altered later, at considerable expense, to make it conform to the local building law.

The choice of materials naturally plays a most important part in the initial cost of the installation. In every case the pipe materials must be chosen with due regard for the chemical content of the local water supply. Some water has little effect on piping, and the cheapest materials may last for the entire life of the building. On the other hand, where chemicals are used in purifying the water or where there is a large natural destructive chemical content, the most non-corrosive metals should be used. The comparative prices of pipes of various materials form an important consideration. Genuine wrought iron pipe costs approximately twice as much as steel pipe, but may be also about twice as lasting, depending on its use and the water it carries. Brass pipe of good quality costs almost twice as much as genuine wrought iron, but it lasts practically indefinitely with average use. Brass pipe made of 85 per cent copper and 15 per cent zinc costs about four times as much as galvanized steel. Usually the horizontal runs of the hot water supply system are the first to cause trouble due to deterioration. For this reason it is advisable to use pipe of the best material as hot water pipes. It is important that the fixtures used with brass pipe be of a kind that will not be conducive to electrolysis, which may cause comparatively rapid disintegration.

In selecting the material for the various pipes it should not be assumed that because one material may cost only half as much as another the installation cost will be half. The cost of installation in an ordinary dwelling may be divided approximately:

1. Cost of pipe and fittings, 30 per cent.
2. Cost of fixtures, 35 per cent.
3. Cost of labor, 35 per cent.

In large work the percentages of cost run about:

1. Cost of pipe and fittings, 26 per cent.
2. Accessories (pumps, tanks, etc.), 11 per cent.
3. Fixtures, 26 per cent.
4. Labor, 37 per cent.

It is relatively easy to find a place for the water supply piping in the average house, because of the

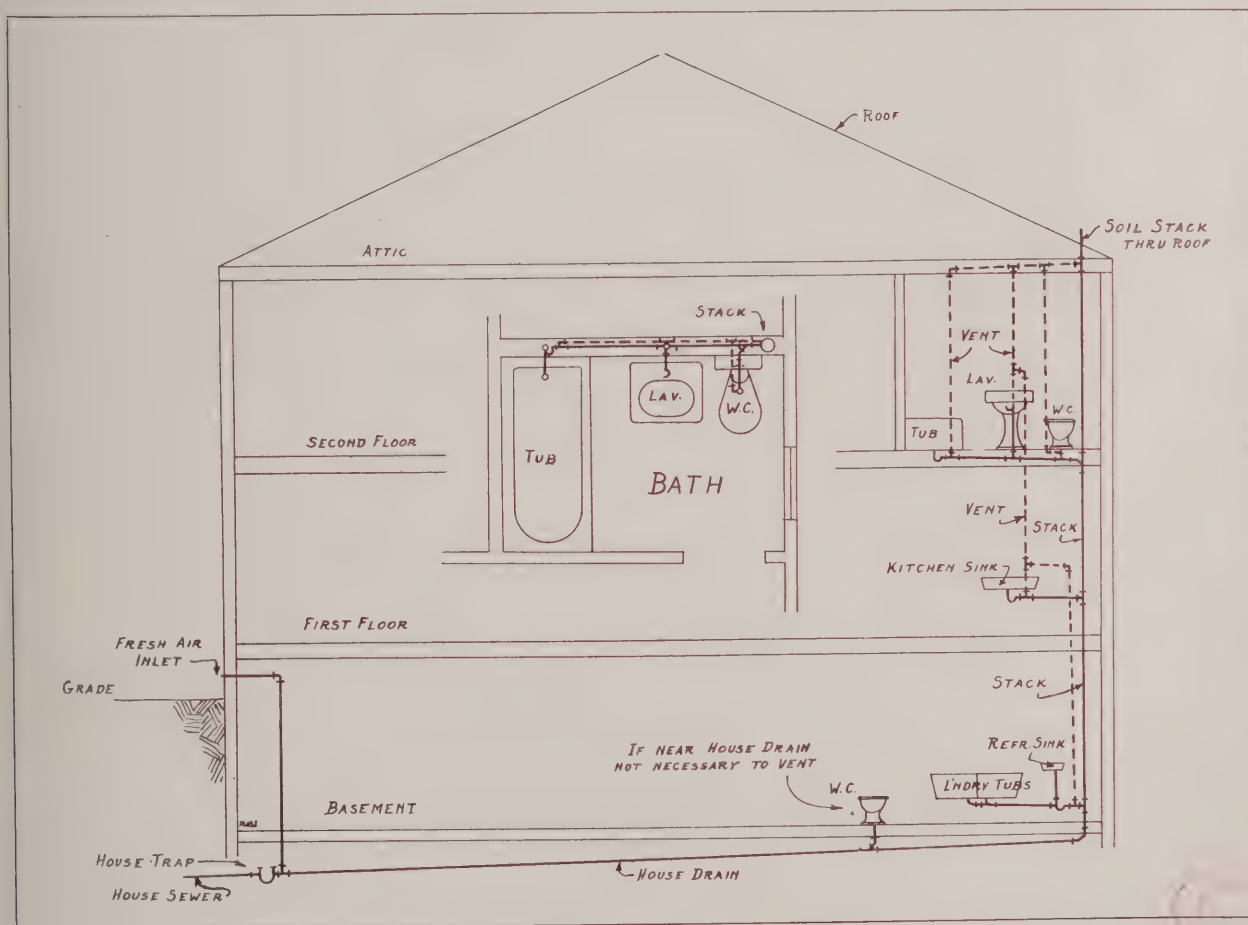
small sizes of the pipes. It should not be installed in an outside wall unless absolutely necessary, and then only when thoroughly frost-proofed. In many cases it is possible to change the location of fixtures to avoid this or to make the connection to the fixtures up through the floor. Water piping should be installed so that it will drain from a few points, preferably one. This is a convenience to the house owner and also a protection, in that he can drain the piping so that it will not freeze and cause damage in case of a lack of heat in the house. It is a convenience, but not a necessity, to install a hot water circulating pipe making the system "circulating"; that is, a continuous pipe in which the water circulates from the hot water heater or tank to all fixtures and back to the heater. This will allow hot water to flow from the hot water faucet immediately instead of having to wait a half-minute or so after the water is turned on. The extra expense of this pipe is small, as it runs alongside of the other water piping. If this is installed, the hot water piping throughout should be covered with insulation, as the heat loss from an uncovered pipe would mean a considerable operating expense. Where economy is the primary consideration, the "circulating" hot water system should not be specified, as it is more expensive in both first cost and maintenance.

Materials. In specifying pipes of various materials it is well to keep in mind several points in addition to those which have already been mentioned.

Cast iron pipe is practically indestructible as far as wearing qualities are concerned. It is therefore used for soil, waste and vent lines. It is absolutely essential that it be used underground inside of the building walls, as it is practically always gas-tight.

Glazed tile pipe does not corrode and is satisfactory to use outside of the house for the house-sewer when there are no trees near it. It is the least expensive of all pipe materials. Tree roots in seeking moisture often find their way through the joints in the pipe or cracks in the tile, and once inside they grow and may finally clog the pipe entirely. The pipe then must be dug up, cleaned out and relaid, or new pipe put in. At additional expense the house sewer can be made of another material where there are trees, and thus avoid this trouble.

Steel pipe, galvanized, is universally used throughout plumbing systems. Its life under adverse conditions may be shorter than pipe of other materials. Steel pipe is used extensively in tall buildings because of comparatively light weight and since, as with any pipe with a threaded joint, expansion joints are easily taken care of. It is used largely because of its low price also. Copper-bearing steel pipe is



Plumbing Diagram for Suburban House

Note: Sizes of all pipes should be indicated on diagram for contractors

better than the ordinary and is much used because it approaches wrought iron in wearing quality and is cheaper than genuine wrought iron. Where the chemical content of the water is favorable, steel pipe has a very long life. In Schenectady, N. Y., for instance, they use steel pipe almost entirely, and its life seems to be as long as that of any other kind of pipe.

Galvanized wrought iron is used for waste and vent connections. It is also used for water piping to a great extent. In the vicinity of New York galvanized wrought iron is used to a greater extent in the plumbing in small houses than any other pipe, although brass pipe for hot water is being installed in the better grade of houses. Galvanized wrought iron is considered under ordinary circumstances very satisfactory for cold water in this section of the country.

Brass pipe is used extensively on hot water, and in the better class, more elaborate houses, on cold water. It is well to use brass pipe when possible for the hot water, as it does not corrode or produce rusty water after a few years as iron and steel pipes are likely to do. Brass pipe costs more than iron or steel, but the length of time it serves before repairs are necessary probably compensates for the difference in cost.

Copper. In some localities, such as Pittsburgh, the water is so corrosive that it is practically necessary to use copper pipe if length of service is a consideration. Naturally the cost of this installation is too great for an average house, but it is certainly worth the money invested in localities where the water supply is of this nature.

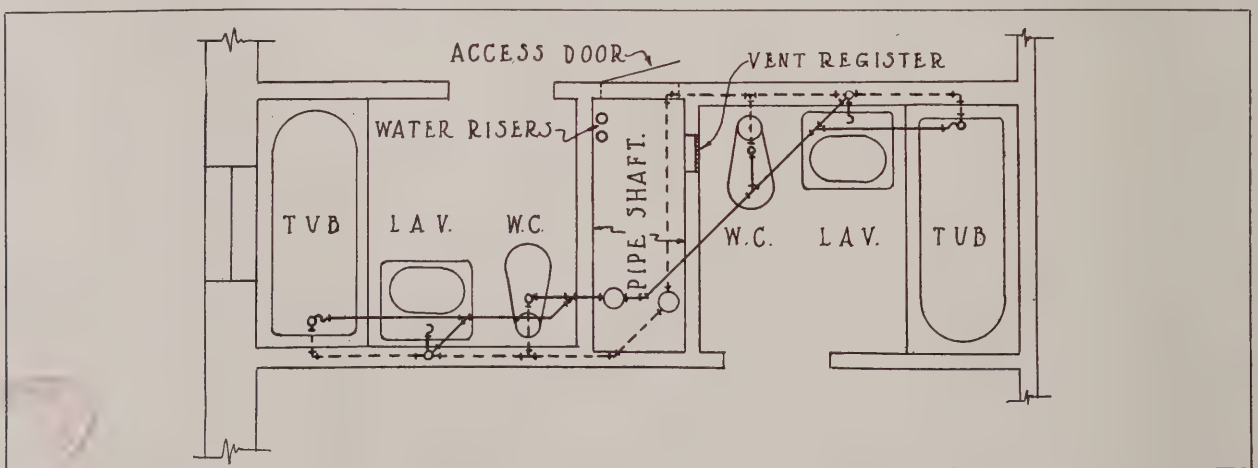
Lead water piping was used extensively until cities and towns started to treat water with chemicals. These chemicals have had a very bad effect on the lead, and as lead is expensive in the finished work compared with other materials, it is not used so extensively. Lead has advantages in that a good plumber can tap the piping for new connections without much trouble in case alterations are to be made.

Fixtures are usually selected by the owner, and like other things the price has an enormous range. There are certain features on which the architect can advise the owner in his selection. There are

several points that must be kept in mind in choosing the types of traps for various purposes. The ordinary "P" or "S" trap should be used for lavatories, sinks and tubs, both bath and laundry. The "drum" traps have the advantages of being easily but not thoroughly cleaned out and being readily accessible, but their great disadvantages are their liability to stoppage due to the permanent interior portion and the possibility of gas leakage through the clean-out. Their use is prohibited in many cities,—New York for instance. The use of "non-syphoning" traps to eliminate the necessity of back-venting is questionable. The so-called "non-syphoning" traps may be objectionable because they may syphon out, be noisy, gurgle, and because they do not allow proper ventilation of the system. The cost of the "non-syphoning" traps is greater than the cost of the ordinary "S" trap or "P" trap. It will be found that a great number of building departments do not allow the use of all types of "non-syphoning" traps. It is my opinion that the simple system of back-venting gives a more satisfactory and efficient result than a system in which the venting is taken care of only by the soil-stack itself, except in the case of very small work.

In designing a large installation, such as that for a hospital or office building, it is essential to have the advice or services of an expert to insure economy as well as efficiency. In the preliminary planning of the building the sketch plans should be carefully checked to see that these several conditions are met:

1. That the stacks should run from basement to roof in as straight a vertical line as possible. This can be accomplished by a vertical pipe shaft in which all the stacks are placed. Doors should be provided to this pipe shaft in which all the stacks are run. Doors should be provided to this pipe-shaft on each floor.
2. Where possible, bathrooms should be located on each side of the stack rather than on one side only.
3. The proper planning and placing of the fixtures in each bath should be such that short lengths of pipe will be used. This page shows a plan for hotel baths. It will be noted that the length of run of horizontal soil or waste pipes is about as short as possible.



An Economical Arrangement of Hotel Baths



ARCHITECTURAL SERVICE FROM THE BUSINESS POINT OF VIEW

BY

C. STANLEY TAYLOR

THE introduction of this new Engineering and Business Section of THE ARCHITECTURAL FORUM forms a definite recognition of fundamental changes which have taken place in the practice of architecture. It is a forecast of a time rapidly approaching when the architect will assume an unusually powerful position in the economic scheme of this country. It is quite apparent that with the passing of the next few years, architectural offices, large and small, will be rendering for their clients a vastly enlarged service, which will include in far greater degree than ever before the protection of the clients' investments. In fact, if the signs of the day are read correctly, many architects will go much further. They will direct the attention of clients to logical investments in the building field and actually promote new projects, even as a few have already done with no sacrifice of ethics or loss of good standing.

Architects must learn to work more closely with other advisory experts who influence the investment and the administration of the building dollar. The interests and functions of the banker, building manager and real estate broker are becoming more closely coördinated with those of the architect. When institutional or educational buildings are to be designed, the architect will more frankly seek the advice of those experienced in such administration. The importance of insurance rating bureaus and building code experts will be more clearly understood; the opinions and demands of loaning institutions will be more definitely determined before the planning of new buildings is undertaken. In other words, it is quite probable that for every new building, before the designer's pencil touches paper, there will be established a functional plan. This functional plan will be an exact determination of space requirements carried out in detailed space units. Paralleling this functional plan there will be the preliminary financing and operating schedule necessary to create the investment and insure its soundness. Only when both of these controlling schedules have been established and declared sound by those who will manage the structure or operate the business within it, will the architect begin the correlating of the space units within the perimeter of the building.

It is true that this broadening of architectural service is a radical departure from practice in some offices; but in line with all modern professional service, the requirements of clients are changing. Building investments are being analyzed and administered today in a manner very different from that of but a few years ago. The high cost of modern building construction and the complexity of

structures are both acting to enforce this condition. It has become recognized that the original plan and the established maintenance costs of buildings like hotels can absolutely insure success or destroy investment values by so loading the projects with unnecessary overhead costs or restricted incomes that they cannot possibly operate profitably. Experienced accountants will testify that many business failures have been primarily due to improper planning and unwise building specifications. Of course, the architect might take the attitude that this is none of his business, and that his function is to plan the building exactly in accordance with the wishes of his client; but it is obvious that the value of his service is tremendously increased when it takes on the function of protecting the investment made by his client.

When we review the waste of the past,—when we note in thousands of existing buildings not only great waste of space but the setting up of high overhead costs and often rapid depreciation,—it becomes apparent that someone must give greater thought to this economic side of building production. It may be unfair to directly charge the architectural profession with the responsibility of creating inefficient space arrangements and the inadequacy of specifications; it may well be that the architect has carried out his instructions, which have often included the sacrifice of quality in order to meet the investment limitation. On the other hand, it is common experience, when a building is unsuccessful, to hear the owner charge the architect with its failure.

Regardless of where the blame may lie, the facts are ever-present, testified to by real estate managers, mortgage companies and the business world in general. Other factors of this field, such as building managers, mortgage bond houses and large mortgage companies, have already taken the lead in the improvement of plans and specifications. Today, the architect faces the problem of being a leader in this field or of carrying out instructions which to a greater and greater degree will come to him through his clients. Far better it will be if the architect can be a leader in eliminating waste and in insuring the success of building investments. This does not mean that he must be "all things to all men," but it does mean that he must have a much broader understanding of the various problems which are involved with every building operation, even those of a residential type. It means that he should recognize the value of consulting service for problems which lie outside the scope of his own function but well within the scope of his understanding and appreciation.

Perhaps the most interesting manner in which to

present forceful proof of this contention will be to consider briefly the economic needs of building projects of various established types and to indicate how certain architects have actually been of great assistance to owners. Accompanying this article is a chart which is quite elemental in its nature, but which serves to suggest logical relationships for the architect in connection with various types of buildings. Considering these various building types in the order in which they are presented, we find that the architect who is carrying out an office building project should establish relations with the financing institution or individual who is providing the building loan and permanent mortgage. Perhaps his first contact will be in the development of the sketch plans which the owner wishes to present with his mortgage application. If the architect is brought into such interviews, he can contribute materially by explaining details of the proposed plan and specifications, and in many instances this means a considerable difference in the amount of financing which the owner may obtain. Before proceeding beyond the sketch plan stage, the building manager should be appointed, and the architect should work closely with him to gain the greatest efficiency of space under the local rental market conditions. He should work with the building manager on the matter of specifications, particularly as to mechanical equipment, finished surfaces, etc., which contribute their quota of overhead and maintenance cost. If the project is large, special consultants may be required for elevators, service areas and other special parts of the building. The insurance engineer is of importance, because if the plans are examined under the local fire underwriter's code, it will be found in almost every case that suggestions can be made which will reduce insurance rates and fire hazards.

The tabulation shows various suggested contacts of this nature for other types of buildings which cannot be analyzed in detail here. It is interesting to note, however, that even in the field of small dwellings this business viewpoint has its direct and important application. Certainly it becomes more important as the size of the dwelling investment increases. There is, of course, the contact with the bank, building loan association, or other source of mortgage money. The architect can prepare for the owner preliminary plans and specifications which will actually help him to get as much as 25 per cent more in the way of a mortgage loan than the owner could probably obtain through a general application.

The owner can be advised to avoid eccentricities in plan or general design which would tend to decrease the ultimate sales value and sales market for the property. Convincing proof of this suggestion may be found by visiting any real estate auction sale where suburban houses and country estates are offered on the auctioneer's block. Time after time it will be seen that attractive but conservatively designed houses bring much higher prices than those which are exceedingly unusual in character or waste-

ful in plan. It is true that the owner who is putting up the money is justified in having what he wants in the way of a house. He may consider it as he would any other luxury, but the rapid changes in business conditions today indicate that sooner or later every house will have to meet the test of appraisal value and of salability. It may be that the owner will wish to dispose of the house in order to build one larger; it may be that unexpected business reverses will force its disposal; it may be that the house will become an important part of his ultimate estate. In any event, it will be offered for sale some time, and if the architect can recommend a degree of conservatism and efficiency in the plan, such service will surely be appreciated and never resented.

In his contacts with the advisers and specialists referred to in the accompanying tabulation, the architect will gain much more benefit than merely the interpretation or solution of a particular problem. Frequent contact with men whose work has a bearing upon the architect's problems must necessarily broaden his own point of view and gradually equip him to render an increasingly valuable economic service to his client. A broad knowledge of banking, building management, insurance engineering, real estate values, and the more highly specialized fields served by various consultants is of particular importance to the architect who is working on large scale operations, but it is none the less desirable and valuable to the architect who purposely confines himself to a limited field or to small buildings. Through contact with successful bankers, the architect will soon acquire a general knowledge of the sort of loans banks desire to make; of the limits that are imposed upon banks by law as to the ratio which the loans may bear to the total investment; and something of the rates and discounts prevailing on loans of various types from time to time. The architect will learn how applications for loans are prepared and how the banker analyzes and examines them with a view to determining the desirability of the loans applied for; and through this knowledge he will be equipped to advise his client intelligently with respect to the data required to assure success in a loan application. Through the banker may also be obtained a valuable knowledge of how to set up a complete financial program covering the investment, fixed charges, operating expenses, and income. To be sure, the banker may not know how many of these elements are actually developed,—that, in fact, is within the province of other specialists in many cases,—but at least he will know how these facts must be presented and how they must relate to one another in order that the proposed project may be assured of financial success for its promoters.

Architects often overlook,—or purposely avoid through lack of sufficient knowledge of how to carry on the work,—opportunities for the promotion of building enterprises, particularly those which require the organization of some form of syndicate to provide the equity financing. Here again the archi-

SCHEDULE OF PROFESSIONAL AND ADVISORY RELATIONSHIPS

FOR THE BUSINESS ADMINISTRATION OF ARCHITECTURAL PROJECTS

In this chart are indicated the sources through which the architect should obtain outside counsel during the development of various types of building projects in order that he may render a more complete and satisfactory service to his clients, with particular reference to the economic aspects of his buildings.

A indicates coöperation mandatory. *B* indicates coöperation advisable.

Type of Building Project	¹ BANKER	² BUILDING MANAGER	³ SPECIAL CONSULTANTS	⁴ INSURANCE ENGINEER	⁵ REALTOR
OFFICE BUILDINGS	<i>A.</i> For senior financing; checking layout and specifications	<i>A.</i> Checking plans for income and operating economies	<i>B.</i> For maximum rentable space, elevators, service areas	<i>A.</i> To obtain lowest fire and liability rates	<i>A.</i> For space demand and most salable features
APARTMENTS	<i>A.</i> For senior financing; checking layout and revenue	<i>B.</i> Checking plans for service and maintenance features		<i>A.</i> To obtain lowest fire and liability rates	<i>A.</i> For space demand, size and number of rooms, renting features
HOTELS	<i>A.</i> For senior financing; checking costs and revenue	<i>A.</i> Checking plans and equipment with hotel manager	<i>A.</i> Service features, room sizes and layout	<i>A.</i> To obtain lowest fire and liability rates	<i>A.</i> For subrental demand and income
DWELLINGS	<i>B.</i> For mortgage or building loans			<i>B.</i> For rates on large dwellings	<i>B.</i> For sale value, local demand
INDUSTRIAL	<i>B.</i> Occasionally for first mortgage or temporary loans		<i>A.</i> For process layouts, material handling, etc.	<i>A.</i> To obtain lowest fire and liability rates	<i>B.</i> Occasionally for housing facilities, etc.
HOSPITALS		<i>A.</i> Checking plans, etc., with managing directors	<i>A.</i> For correct layout and equipment	<i>B.</i> To obtain favorable insurance rates	
INSTITUTIONS		<i>A.</i> Checking plans, etc., with managing directors	<i>A.</i> For correct layout, special equipment	<i>B.</i> To obtain favorable insurance rates	
SCHOOLS		<i>A.</i> Checking plans, etc., with managing directors	<i>B.</i> For special features, mechanical equipment	<i>B.</i> To obtain favorable insurance rates	
BANKS		<i>B.</i> For service and maintenance features.	<i>A.</i> For vault design, banking equipment; protective systems	<i>A.</i> To obtain lowest fire, hold-up, robbery, and liability rates	<i>B.</i> For rental features when rental space is included
PUBLIC BUILDINGS		<i>B.</i> For service and maintenance features.	<i>B.</i> For special features; mechanical equipment	<i>A.</i> To obtain favorable insurance rates	
CLUB AND FRATERNAL	<i>B.</i> Occasionally for mortgages and temporary loans	<i>A.</i> For service and maintenance features.	<i>B.</i> For mechanical equipment, swimming pools, etc.	<i>A.</i> To obtain favorable insurance rates	
RELIGIOUS				<i>B.</i> To obtain favorable insurance rates	
STORES AND SHOWROOMS	<i>A.</i> Senior financing; checking revenue	<i>A.</i> For service and maintenance features.	<i>B.</i> For show cases, escalators, elevators, etc.; mechanical equipment	<i>A.</i> To obtain lowest fire and liability rates	<i>B.</i> For rental values, traffic courts, space demand

¹ BANKER: This refers to the source of mortgage funds, including mortgage bond houses and investment companies

² BUILDING MANAGER: Includes the professional building managers of office buildings and the managing directors or other persons in charge of the operation of institutional buildings

³ SPECIAL CONSULTANTS: Includes all special consultants and advisers specializing in various types of buildings or equipment

⁴ INSURANCE ENGINEER: This refers to the trained experts available through insurance companies for checking buildings with respect to insurance requirements

⁵ REALTOR: This denotes the experienced local real estate broker or agent

tect's contact with bankers will put him in a position to find out from experienced men not only how these things are done, but where he may go to find individuals who might be interested.

The building manager is another mine of information to the architect. From him there can be acquired a general knowledge of the service requirements of various types of buildings; of the proper use of various materials and equipment items, particularly with respect to their cost of maintenance and operation, and of the means of developing proper space efficiency. The building manager is concerned with the problem of selling or leasing the space which the architect designs. Naturally, he must acquire a practical knowledge of what is salable or rentable, and this knowledge should be a part of the architect's own equipment. But the manager goes further than that. He must operate the building, and he soon acquires a very sound knowledge of the relative values of wall finishes, types of floors, types of heating systems, elevators, and all manner of other appurtenances for office buildings, apartments, hotels and other structures which come under his hand. Through friendly contact with successful building managers, the architect may acquire much practical knowledge which will improve his own work and increase his value as an adviser to his clients. Likewise, the various special consultants, to whom the architect should go upon occasion for the solution of specific problems in connection with a building type of unusual character, have much information of a general character which the architect should add to enlarge his own mental equipment.

An examination of the accompanying chart will show that the insurance engineer is an adviser who should be consulted by the architect on practically every type of building operation. Only in the case of dwellings is the insurance engineer's contact omitted from the tabulation, and even here there are occasions when insurance requirements should be taken into consideration by the designer, especially when large and costly dwellings have been commissioned, or where garages are incorporated in the houses. The services of insurance engineers are offered without cost to the architect or owner by the great insurance companies of the country which maintain staffs of specialists trained to understand and interpret insurance ratings in terms of building design and materials. The architect may submit without charge his preliminary studies to the insurance companies and have them advise him of the probable insurance rate that would be applied to the building upon completion. They will also freely indicate what things could be done to so reduce hazards in the building as to result in a markedly lower insurance premium. Very often the insurance engineer's recommendations can be adopted without additional cost to the owner and thereby save an annual charge which in time might substantially reduce profits. These engineers are practical men in most instances, and frequent contact with them will

soon give the architect a sufficient working knowledge of insurance companies and rating bureaus to enable him to plan his buildings in the first place in accordance with modern recommended practice, and to advise his own client when a building is first proposed what he should do to secure the best rates.

Of course, the realtor has much information of value to the practicing architect who is frequently engaged on buildings of an investment or speculative nature. The practicing real estate broker is a source of much information regarding land values and their prevailing trends, rental demand in various sections, the prices paid for space, and the salability of buildings of all types. The architect who has a sound basic knowledge of these matters can talk to his investor-client in his own language and show an appreciation of the investor's problem that would be most convincing evidence of the architect's capacity to design a building which will serve the intended purpose and assure maximum return.

Thus it is that architects gain a two-fold advantage in maintaining broad contacts with other representatives of the business world. For the sake of their clients' interests, they should maintain these contacts so that individual operations may be developed under the guidance of men whose work enables them to direct various aspects of a building project toward a successful conclusion; and for his own sake, the architect should continue to maintain these contacts that he may increase his capacity to serve.

The statement is often made that architects are not well paid for their work, and except for very well established organizations, this statement is generally true. Accepting the fact, let us seek the reasons, of which there are two. In the first place, so much of the architect's work is carried out behind his own walls and so few of the vast number of details are understood or appreciated by the client, that his work does not seem difficult or complicated, and his compensation appears to the client to be ample, even though it may be very small. The second fact is that the architect is frequently not taken seriously from a business viewpoint. He is not expected to have the degree of common sense that is required when a lawyer is retained or when a physician is called in. Let this condition be once cured,—let the client develop respect for the architect's desire and ability to protect his investment,—and the whole matter assumes a different aspect. Proper fees will be paid willingly and promptly, and the architect will gain his rightful place and business relationship.

The best way for an architect to gain at least a reasonable degree of knowledge pertaining to the business aspects of a building project is through an interchange of experience and facts relative to its economic problems. With this thought in mind, it is planned that this department of THE ARCHITECTURAL FORUM will be given over to a presentation of extremely practical information, including very little theory and consisting for the most part of facts gathered from experience of architects and business men.

PRESENT STATUS OF COÖPERATIVE APARTMENT PROMOTION AND FINANCE

BY

LOUIS G. KIBBE

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WHILE statistics are not always wholly reliable, they do serve to chart definite trends, and the data given here are presented to reflect the growth and development of coöperative housing in the east side residential section of New York during the seven-year period from 1922 to 1928 inclusive. No attempt has been made to compile statistics for the period prior to 1922, nor statistics for the entire city.

Since the stock of a coöperative apartment corporation is based upon the equity (the difference between the mortgage and the total sales price), it is common practice in this city to speak in terms of equity values. However, in determining a true comparison, the over-all values should be considered in a study of these tables. It is interesting to note the constant growth in the number of projects in the east side residential area from three in 1922 to 17 projected for completion in 1928, with corresponding over-all values of \$3,950,000 in 1922 and \$34,068,500 in 1928. Between 1922 and 1924 there was a slight decrease in the over-all value per room, the minimum for the entire period being \$5,000 reached in the latter year. Since 1924 the over-all value per room has increased steadily to an average of \$9,030 in 1927 and \$9,017 in 1928. Naturally, there has been a corresponding increase in the average equity per room, although, due to slight fluctuations in the ratio of mortgages to total values, a comparison of equity values is not as accurate as a comparison of over-all values. The average equity per room was lowest in 1922, when it was \$2,095, and it reached a maximum in 1927 of \$5,059. The increase in the average value per room, whether contrasted with the total value or the equity value, is approximately 100 per cent, and such a startling increase in so short a period of time is worthy of much study. While this increase may be attributed in a large measure to advancing land costs, there are other contributing factors which should be taken into consideration in the planning of future projects, and which will be referred to later.

Indicative of stabilization in the financing of coöperative apartment buildings, it is interesting to note that the ratio of mortgage indebtedness to total over-all prices of land and buildings has remained fairly constant, at approximately 50 per cent. This is due in a large measure to insistence by prominent real estate agents identified with the coöperative movement that the financing of these projects be standardized on a conservative basis. It has come to be almost a cardinal principle in the financing of east side coöperative projects to secure only institutional loans in such conservative amounts as to merit minimum interest rates and minimum amortization. This policy has had the effect of winning the confidence of conservative mortgage institutions, such as

life insurance companies, title insurance companies, and savings banks, which now lend freely, but at the same time conservatively, on coöperative buildings.

Contrary to a popular misconception, high amortization of mortgages is not necessarily indicative of conservative mortgage practice, but in most instances it should be taken as a clear signal that the amount of the mortgage is excessive. Due to the high character of the lending institutions identified with the financing of coöperative apartments in New York, the promoter can rest assured that a mortgage loan granted by one of these institutions and carrying low amortization, or even no amortization, presupposes an increment rather than a depreciation in the value of the land and building at the date of maturity. In the interest of economy in operation, as well as of conservatism in financing, I favor the low mortgage with correspondingly low interest rate and low amortization, as opposed to the practice advocated in some other cities of mortgaging heavily with high interest rates and liberal amortization. Advocates of the latter method point to the low equities made possible by high mortgages, but my answer is that under that plan every stockholder-tenant is penalized by the excessive cost of financing, and is deprived of the opportunity of securing the economy that he would enjoy under the plan which I advocate. It is admitted that under the low mortgage plan the purchaser of an apartment is called upon to pay a larger amount of cash, but the saving to him in interest and amortization payments, together with the feeling of security in the knowledge that his building is conservatively financed, offsets the disadvantage of having to expend a greater amount of cash in acquiring his apartment. Moreover, it is nearly always possible for a purchaser to arrange terms for payment for his apartment which limit expense and risk incident to such financing to the individual affected without imposing additional expense upon the other tenant-owners. I have stressed the item of mortgage financing for three reasons,—first, in the interest of conservatism; second, because of its effect upon economy of operation; and third, and most important of all under existing conditions, because of its effect on the initial cost of the project. Due to soaring land values, with which it seems hardly conceivable that rents can keep pace, the promoters of coöperative apartments are called upon to use every means at their disposal of reducing the cost of construction. The cost of financing is an important item and worthy of consideration in planning a coöperative building. It has much to do with its success.

To bring out more fully the meaning of my reference to the relation of rental values to land costs, a word may be in order. It was common practice but

	1922	1923	1924	1925	1926	1927	1928
Number of Projects.....	3	4	14	17	15	14	17
Number of Apartments.....	95	216	420	496	385	431	532
Average Number Apartments per Project	33	54	30	29	26	31	31
Number of Rooms.....	639	1,360	3,412	3,406	2,614	2,783	3,773
Average Number Rooms per Project.....	213	340	244	200	174	198	222
Total Sales Price.....	\$3,950,000	\$7,824,500	\$17,072,300	\$24,314,500	\$20,706,300	\$25,129,800	\$34,068,500
Average Sales Price per Apartment.....	\$41,579	\$36,225	\$40,650	\$49,000	\$53,780	\$58,300	\$64,038
Average Sales Price per Room.....	\$6,180	\$5,750	\$5,000	\$7,135	\$7,920	\$9,030	\$9,017
Total Mortgages	\$2,611,000	\$4,010,500	\$8,227,600	\$11,500,000	\$10,591,300	\$10,879,800	\$15,655,000
Average Mortgages per Apartment.....	\$27,485	\$18,566	\$19,590	\$23,185	\$30,300	\$25,638	\$29,464
Average Mortgages per Room.....	\$4,085	\$2,945	\$2,411	\$3,376	\$4,462	\$3,970	\$4,143
Total Equity	\$1,339,000	\$3,814,000	\$8,844,700	\$12,814,500	\$9,040,000	\$11,050,000	\$18,413,500
Average Equity per Apartment.....	\$14,094	\$17,659	\$21,060	\$25,815	\$23,480	\$32,662	\$34,574
Average Equity per Room.....	\$2,095	\$2,805	\$2,589	\$3,759	\$3,458	\$5,059	\$4,874

a few years ago to show an investment return to the coöperative purchaser of from 12 to 15 per cent,—that is to say, the proprietary rental of a given apartment when deducted from the commercial rental value of a similar apartment produced a saving sufficient to represent a yield on the investment of from 12 to 15 per cent. While rental values have become fairly stabilized in the well developed residential areas, such as upper Park and Fifth Avenues and the principal side streets between Fifth and Lexington Avenues, the land values in these areas continue to advance, and instead of an average investment return, such as was just referred to, we now find it difficult to produce a return of more than 10 per cent in these areas. However, since economy is but one of the numerous advantages of coöperative ownership, it does not necessarily follow that a project showing slight economy to purchasers is without merit. It does require that the promoters give more attention than ever to such factors as location, plan, equipment and construction. This condition has also led to the development of new residential areas where lower land costs permit of the delivery of apartments showing satisfactory economy, and notable among these sections may be cited the Sutton Place district.

A distinct factor in the present situation is the great increase in the value of land in the narrow side streets, where the heights of housekeeping apartment buildings are limited by law to one and one-half times the width of a street. The relation of land values to rental values in these narrow side streets is such that it is increasingly difficult to show any economy in a coöperative building of nine stories. This has had the effect of automatically removing most of the plottage on these side streets from the coöperative market, forcing promoters to the avenues and the few wide streets. The demand for plots that will permit the construction of 15-story buildings has had a decided influence upon increase in land values on such streets and avenues as are eligible.

We are forced by this condition to divide coöperative projects into two classes,—one, where the element of economy or saving in rent is ignored and elements of location, exclusiveness, excellence of plan, etc., are stressed; the other, where location is subordinated to economy. As characteristic of the two types, there are now under construction two buildings that may serve to illustrate the comparison. One is 960 Fifth Avenue, where Anthony Campagna, the well known builder of coöperative apartments, is sparing no expense in producing one of the most luxurious apartment buildings ever designed, with an ideal location in the very heart of the Fifth Avenue residential district, on the site of the former Clark mansion. Mr. Campagna is boldly expressing his confidence in the taste of New York's scions of wealth by offering individually planned apartment homes, ranging in size from 13 rooms with five baths to 19 rooms with nine baths, with ceiling heights up to 17 feet, and with living rooms as large as 22 x 40 feet at prices ranging from \$130,000 to \$310,000. An interesting feature of this building is its having a section for rental, having a separate entrance on 77th Street, and containing about 50 housekeeping suites. The income from this section will be applied to the cost of operating the entire building, resulting in an estimated reduction of the proprietary rental of the owners' apartments to 5 per cent, or less than half of the general average in 100 per cent coöperative buildings. The other project alluded to was conceived in the interest of economy, the idea of the promoters being to supply well designed apartments in an accessible location at prices below the market average and with a proprietary rental that would reflect satisfactory economy and saving over commercial rental values. This building is being constructed by Fred T. Ley & Co., Inc., at 333 East 68th Street, opposite St. Catherine's Park, and will be of 15 and 9 stories, having units of four, six and seven rooms at an average equity value of under \$2,800 per room

as against the 1928 general average equity value of \$4,874. This price was made possible by low-priced land, opposite the park, where the law permits the construction of a 15-story building. Moreover, due to the unusual depth of the plot, the architects, Van Wart & Wein, were able to design an economical building that covers only 57 per cent of the plot area, providing unusual light and air to all apartments.

For the benefit of those who do not wish to disturb invested capital or who, for any other reason, desire to purchase their apartments from income, a plan has been devised providing for a series of time payments over a period of five years. The method has become the accepted and general practice in the purchase of private houses. Through its use, the purchaser may now acquire an apartment in this building by paying a small portion of the purchase

price between the date of purchase and the beginning of occupancy, and then pay the remainder of the amount, like rent, over a period of five years, during which time he may live in the apartment and enjoy its economies and other advantages. Simply stated, the time payment plan provides that anyone buying on January 1, 1928 would pay in cash 30 per cent of the term price of the apartment, the remaining 70 per cent by a note bearing interest at the rate of 6 per cent on the unpaid balance from April 1, 1928, and payable in monthly amounts over a period of five years, the first payment with accrued interest being due and payable October 1, 1928. The note will be secured by the stock and lease pertaining to the suite selected, no other security being required.

To enable the reader to visualize the advantages of the plan, this example sets forth the full details:



Coöperative Apartment, 960 Fifth Avenue, New York
Warren & Wetmore, Rosario Candela, Associated, Architects
Cross & Cross, Supervising Architects

"B" Apartment,—Second Floor	
Term sales price	\$11,000
Initial payment on signing purchase agreement (30%)	3,300
	7,700

Balance (70%) represented by a note bearing interest at 6% from April 1, 1928, payable in 60 equal monthly installments, beginning October 1, 1928. (The interest from April 1, 1928 to October 1, 1928, amounting to \$231. is payable with the first payment on principal of note) \$7,700

Thereafter the total estimated average monthly payment during the five-year period, amounts to \$245.82, made up of:

Monthly payment of principal	\$128.33
Average monthly interest (varying with the amount of note outstanding)	19.57
Estimated monthly maintenance	97.92
	\$245.82

This plan assures the early purchaser of a choice of space and the opportunity of arranging it (within structural limitations) to conform to his own desires, with the further advantage of deferring payments as indicated. Since payments of principal and interest do not begin until October 1, 1928, the purchaser is relieved of the possible burden of making monthly payments while paying rent elsewhere.

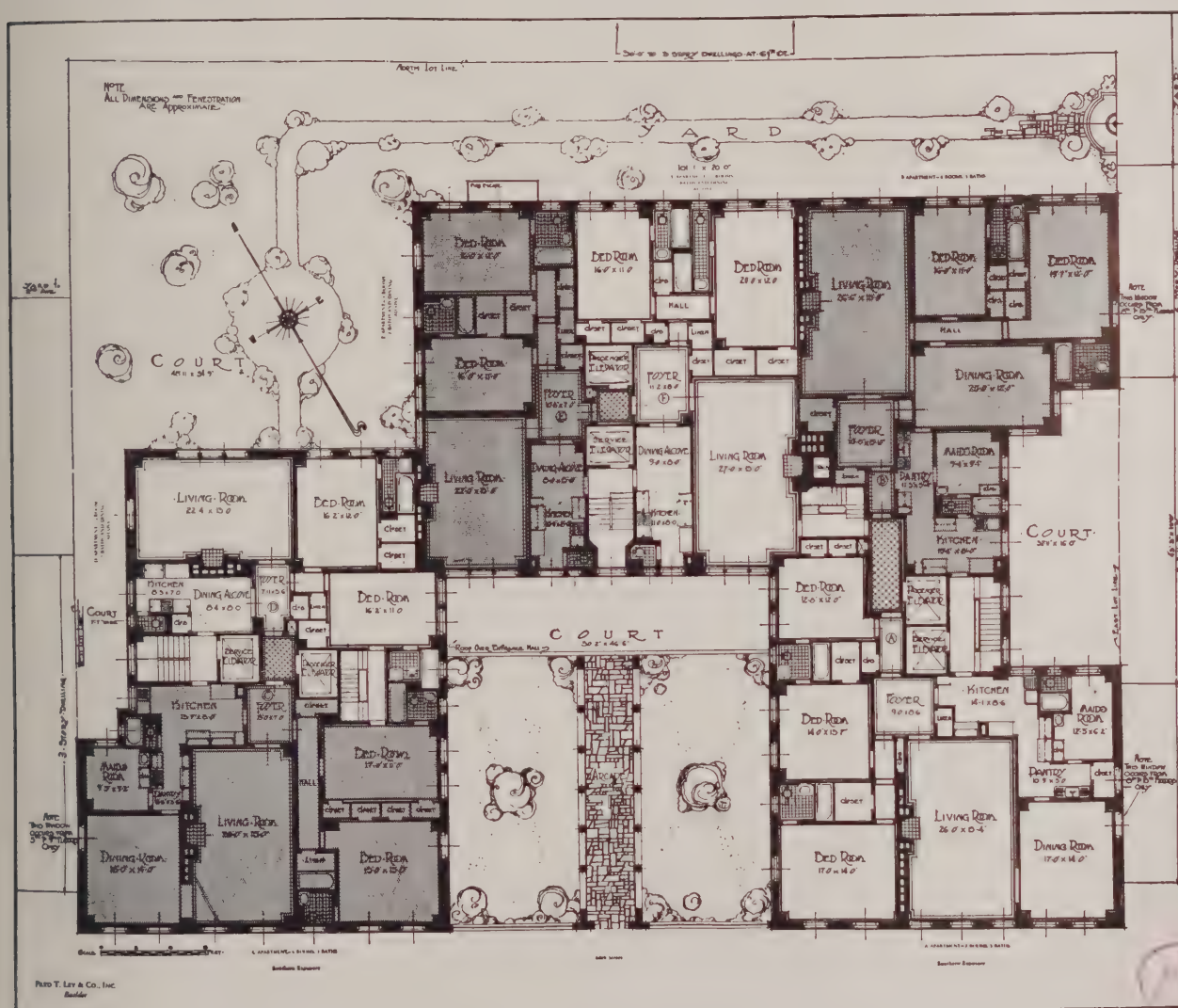
Another factor entering into the growing costs and the difficulty of establishing liberal savings to tenant-owners is the commendable improvement in the standards of design, construction and equipment demanded by the present-day purchasers of apartments. Wood-burning fireplaces, adequate closet space, mechanical refrigeration, spacious room sizes, ample baths, well planned kitchens and pantries, and adequate accommodations for servants, are some of the features that are regarded as almost standard in the coöperative apartments of today. Of great interest to the buying public should be another innovation recently introduced by the promoters of coöperative apartments in New York. This is the employment of a supervising architect, engaged with the approval of the agent, to represent the interests of the tenant-owners. Notwithstanding that over \$100,000,000 of the public's money has been handled by the agents and builders of coöperative apartments, largely on faith, and with most satisfactory results, a number of farsighted promoters have felt the need of relief from the delicate responsibility of expending these huge sums in the interest of the apartment purchasers without some form of independent supervision over their stewardship. It is the duty of the supervising architect to review and approve the specifications of the building; to inspect the work of construction, and to render fortnightly reports in duplicate to the agent and the builders;

to call attention to departures from the specifications, if any occur; to issue certificates to accompany calls for progress payments by purchasers, certifying that the work performed by the builder is in accordance with the terms of the purchase agreement; and finally, to deliver to the owning tenants a certificate to the effect that the building has been completed in full accord with the contracts and specifications under which the tenant-owners have acquired their respective apartment homes. In addition to these contractual obligations, the supervising architect coöperates with the builder, the architect and the tenant-owners in harmonizing the interests of each and in producing a building of the highest possible standards at the lowest possible costs consistent with the specifications and terms of the plan of organization. In several of the recent coöperative projects an independent lawyer has been engaged to represent the tenant-owners, it being his duty to examine and approve the plan of organization, the proprietary leases, and the agreements for purchase of stock, the certificate of incorporation and by-laws of the apartment corporation, the builders' agreement, the agreement with the managing agent and all other legal papers in which the tenant-owners have an interest.

Whether an independent attorney is engaged to represent the interests of the tenant-owners or not, it is highly desirable that the attorney selected by the promoters to handle the legal matters pertaining to the plan of organization, forms of contracts, proprietary leases, etc., be experienced in this work. In fact the legal aspect of coöperative apartment house development and organization is highly technical and calls for the services of specialists in this particular field. It is not sufficient that the plan of organization be limited to the individual project; it must be considered as a part of an important and growing industry, and consideration must be given to the effect upon this industry that might result in a future controversy, occasioned by an improperly framed plan of organization or proprietary leases. This imposes upon the promoters of these projects the distinct obligation of placing their legal affairs only in the hands of attorneys thoroughly conversant by experience with the ramifications of coöperative housing. While these matters may not directly affect the interests of the promoters, they are of vital importance to the tenant-owners, and it is most important that the certificate of incorporation, the plan of organization, supplementary contracts, proprietary leases and other documents be drawn with a view to protecting the tenant-owners to the fullest possible extent.

The scarcity of plottage and the high land values already alluded to have been influential in the introduction of the leasehold coöperative apartment, where the land is leased for a long term of years, usually for 21 years, with three renewals. Notable among coöperative apartment buildings constructed on leased property may be mentioned 280-290 Park Avenue, 300 Park Avenue, 810 Fifth Avenue, and 775 Park Avenue. As an offset to the obvious objec-

In the promotion and financing of cooperative apartments, whether under the 100 per cent plan or the group ownership plan, the help of a wholly trustworthy firm of real estate brokers, with broad experience, is of the utmost value. Such a firm knows land and rental values, and is in a position to advise with the promoters and to safeguard their interests.



Cross & Cross, Supervising Architects

CAN THE ARCHITECT SERVE THE SPECULATIVE BUILDER?

BY

GEORGE F. ROOT, 3rd

HAD this question been asked as recently as a decade back, the answer given by the great majority of those who were engaged in erecting residences for selling would have been a sharp negative. Builders were for "cutting costs" in this kind of enterprise in every respect. They felt that if they could produce a structure containing a given number of rooms, almost regardless of arrangement or shape, using visible materials and colors which would catch the public's eye, and could get this effect with the cheapest materials which would hold together for a year or two after completion, then a quick sale with good profit would result. It usually did result. So, the builder would reason, why go to the costly and unnecessary extent of consulting an architect? The prospective buyer, a layman, knew little or nothing of architectural design, either external or internal, nothing of good plan, good circulation and the taking advantage of land contours, exposures and outlooks; nor was he even particularly interested, if the house was of a size to shelter his family, and if the visible construction made the thing look like a "good buy." Thus we saw row upon row, everywhere, of contractor-designed residences of quite horrible aspect, inside and out,—things from which architects and designers could not but turn a bruised eye,—houses sold, occupied, and containing numberless contented residents; and we saw hun-

dreds of contractors, encouraged by the ready selling market, grow prosperous from the indiscriminating public taste. Why, indeed, go to any highfaluting architect with his talk of "proportion" and "harmony" and "style"? The builder could get out his carpenter's pencil and square and a piece of building paper and produce a drawing which would be adequate for translation into a salable house.

Nineteen twenty-eight will not be the millennium in this regard. There are still being erected residences without harmony of form or arrangement, laid out without expert guidance, but unquestionably the builders who sell have begun to feel the existence of a new and different condition. The fact is that the public has begun to discriminate. The tremendous volume of residential work which has been designed by architects for private clients during the last 20 years, and the ever-increasing merit of this design, have more than merely begun to impress those who would "rather buy than build." The average intelligent layman is beginning to compare. He is shown by the enthusiastic agent a new house which can be bought. Consciously or not, he forms a comparison between it and the houses of his friends who have "had architects." He sometimes goes wrong and accepts that which is not architecture; but his percentage of bad choices is diminishing at an accelerating rate. Even now, more often than



Editor's Note. The Quality of Architectural Design Is Important in Selling an English Stucco House

George F. Root, 3rd, Architect

not, the buyer knows, by having seen good residence design, whether the offering shows trained conception and sound structure; he is more discriminating.

Not only does he perceive better than formerly whether he is getting full value intrinsically and aesthetically only at the time of inspection. The consideration of the resale value, should he ever wish to move away or capitalize his holding for any reason, enters into his decision and often determines it; for the better the design, the more it will bring in a later transaction. And there are now not infrequent cases, some completely authenticated, where a prospective buyer asks to be allowed to consult the architect before making up his mind as to a purchase in order to be informed as to the future possibilities of harmonious and practicable addition to the house; and when this is found to be entirely feasible, as is usually the case with an architecturally designed house, the deal is that much likelier to be made. Back in the recent dark ages of American speculative building the seller, if asked by his prospect, "Who designed this house?" could expand the chest, thumb the armholes, and throwing modesty aside could reply, "I did; you are at this very moment in his presence!" and get his desired effect. Now that seller is demonstrably better off if he can point to a reputable architect by name as having done the work. For his prospect realizes that services so peculiarly special as those of residence designing are better performed by specialists who concentrate on and make a life work of it.

This is by no means mere theory. The writer has watched it work in particular instances. In the case of one high class suburban acreage which was subdivided four years ago and sold in large measure to builders, he has watched the results in the development of perhaps two dozen residences erected for sale, with the land included, at prices ranging from \$25,000 to as high as \$75,000. In certain instances the hit-or-miss house has found its buyer promptly,—say upon completion. But in an impressive majority of cases it has been the dwelling built from an architect's pencil which has proved to be the "hot cake." The \$75,000 property referred to, architecturally designed, was sold at the asking price before the painters were out of it. It has not been rare that the architectural house has got its man before the foundation has been completed, while there have been a number of houses sold from the architect's plans before a spadeful of earth was turned. Say that economic conditions have been right, the lots desirable, and the selling market good. Yes, but no more so for the one kind of house than for the other. When one house stands stark and empty for two years, while its neighbor is "gone" before completion, it is evident that something is operating in the mind of the buying public. The writer believes that it can be only a newly acquired and ever-increasing discrimination and architectural *savoir*.

But there is that architect's fee!—some builders still complain. The idea of paying 8 or 10 per cent

of the cost of the work, as they hear of private clients paying, seems a lot to take off their profit. They are wrong about that in two ways. They do not realize that when designing for a builder, by being relieved, first, of the time necessary for detailed supervision of construction, and second, of the responsibility to the client for the exact following of a detailed specification, the architect can reduce his fee considerably from what he must charge a layman client. Therefore the architect can supply preliminary sketches, general working drawings, outline specifications, and full detail drawings, with perhaps an occasional visit to the work (which is in the architect's own interest anyway) for a sum which should be, and has been, regained by the builder thrice over in the added market value of his finished project. The architect's fee has rightly earned its place in the builder's budget.

An instance is brought to mind of a builder who had been doing his own designing with only moderate success. One of his backers prevailed upon him to consult John Doe Smith, architect, regarding the house he was then contemplating. The builder had drawn his tentative plan, and brought it to Mr. Smith for examination and suggestion. The latter found the layout meritorious in a number of respects, but lacking otherwise that *savoir* referred to here. For instance, one had to cross both the pantry and the long dimension of the kitchen in order to reach the cellar stairs. Now it seems beyond dispute that the householder would only slightly prefer to avoid walking the nautical plank than to run the gauntlet of a servant-filled cuisine while in the discharge of his heating or fermenting or other cellar routine. The stairs were re-located so as to be reached from either the service or the master portion of the house. Again, the master bathroom was arranged so that it contained two doors, one from each adjoining bedroom. It was a simple matter for the architect to rearrange it so that this bathroom possessed only one door (always preferable to two) but with access from each bedroom through a small private vestibule. Many other interior suggestions, as well as an entire re-study of the exterior were made. Not only made, but accepted with amazing alacrity by the builder. Though not wishing to have this paragraph read like a testimonial to the results of three applications of, say, "Tonex," since which no substitute has been accepted, the writer has observed that this builder has done no more work without architectural service, and that his success in the locality is being for the first time widely remarked.

The architect serves the speculative builder, moreover, in other ways than in giving the latter's product beauty of aspect and propriety of plan. He is ready to be consulted as to proper placing of the building on the plot, keeping back from the street or away from undesirable side or rear line conditions; to counsel appropriate planting, walks, and in some cases garden layouts, all features which can attract



Editor's Note. An Excellently Designed House that was Sold before Completion
George F. Root, 3rd, Architect

or repel a buyer; he can lead the builder away from unsightly fireplaces and mantels and give him a "selling point" in their stead; he is often familiar with the newest trends in even such prosaic equipment as ranges, plumbing fixtures, tiling and the like; above all, in a word, he can become indispensable in getting the most for the builder with the least expenditure.

There is another aspect to this question which is broader than that of the architect's value to the individual speculatively-built dwelling. In the case of the subdivided acreage referred to here, the plots were sold to different individuals, each with his own idea of what should be built on his piece. Now that the development is largely completed, we find a curi-



Editor's Note. Anachronisms in Design, such as the Peculiar Fenestration, Have Kept this House Vacant
A House Typical of "Contractor Design"



Editor's Note. A Colonial House that Found a Ready Purchaser Because of Its Design
George F. Root, 3rd, Architect

ously mixed appearance in the locality as a whole. In many instances we see individual units which are well conceived and executed as to house design, planting, and general aspect. Next door there may be also a successful result. But between them there is no harmony of relationship, no team work. Colonial, Spanish, English, alternating irregularly down

the street, a series of well designed houses, perhaps, but entirely unrelated, with no common thread to pull them together into a harmonious and unified whole. Thus we lose in this country, through the fact that our best design bases itself on the various styles of the past and through the fact that the selection of style is generally at the layman owner's op-



Editor's Note. In the Same Development as the Others, Its Design Has Retarded the Sale of This House
A Good Architect Could Have Aided the Builder

tion, that harmony of community design which we find so charming in the countryside of England and France and Italy, where in each country the style is indigenous to the locality. This loss is, of course, unavoidable in the case of most American community developments, where properties are sold to unrelated individuals. Here team work is about impossible, and the most we can hope for, unless one architect or group of associated architects can be retained by the various plot buyers and allowed to work on a group of properties, is a heterogeneous aspect when development has been completed.

But there are scores of instances where an individual builder or a syndicate of speculators purchases a considerable number of adjoining plots, even an extensive acreage, and it is here that the architect can serve not merely the unit but the whole. A decision as to the general architectural style can be reached between architect and client, and the architect can go to work relating his units to one another as regards both style and plan. He can put service wings and garage drives of adjoining units together, keeping main living rooms in their proper relation, each to its neighbor. He hasn't that doubtful fear that on an undeveloped lot adjoining a service yard and garage entrance will be the main features of his living room view, or that the clothes yard which he is placing for his client is going to bring the ill will of whoever builds next door. He can produce a community of residences, the charm and therefore the selling price of each of which will be enhanced, not diminished, by the presence of its neighbor. An instance of the success of this plan of procedure by the developer may be of interest. There is a large acreage in a Philadelphia suburb, Chestnut Hill, which has been steadily developed by an individual, Dr. George Woodward, during some 20 years. One drives through it now and is quite startlingly impressed with the varied uniformity which pervades

this entire district. It is an architecture of stone, easily quarried nearby, which is seen in almost every building; it is the old Germantown style, freely adapted and varied, which greets the driver over the curving streets. Harmony without monotony everywhere. How was this happy result achieved? The developer, from the start, has made certain to employ trained architects to carry it on. Not one but successive architects, each in sympathy with the last, each carrying on under this most intelligent developer's direction. One does not find many Chestnut Hills, harmonious, varied, charming, triumphs of the side-by-side efforts of developer and architect!

But this branch of the architect's usefulness to the speculator can sometimes go even one step further afield. Where the purchasers of acreage secure sufficient land to require planning of new streets to subdivide it, skill is required to get the most out of the possibilities for development. Too often we have seen the old "checkerboard" layout, stiffly rectangular blocks formed by stiffly straight streets,—no curves to give good perspectives, no interest in the conception,—just monotonous square intersections, acre after acre. Something better than this can be devised, no matter how flat and treeless the ground, and the architect can devise it. The writer is reminded of a suburb of New York which was given its first real development about 25 years ago. The original developers had the good sense, in its very inception, to form a street layout for many hundred acres which embraced scarcely a straight road. This plan has been followed, and the absence of regularity of streets is regarded by its residents as one of the chief charms of the village. It is perhaps not of frequent occurrence, but when large acreage is purchased for development, as well as when one house is contemplated, the architect can serve his builder-client to the latter's advantage,—yes, monetary advantage,—even from the start of the operation.



Architectural Merit Was the Greatest Factor in the Purchase of This House

George F. Root, 3rd, Architect

BUILDING ACTIVITY IN 1928 TO CONTINUE ON THE SAME SCALE AS IN 1927

BY
C. STANLEY TAYLOR

IN attempting to establish a forecast of building activity for the year 1928, we face a paradoxical condition. On the one hand we have casually expressed opinions indicating less building activity than in 1927; on the other hand, we have the actual evidence of work under way on architects' boards or seriously contemplated for 1928 which indicates that building will continue at least in the same volume if it does not reach even greater totals than last year. The figures presented in the forecast tabulation included here have been developed in the same manner that the Research Department of THE ARCHITECTURAL FORUM has used in carrying out successful forecasts for six consecutive years. Confidential reports were received from almost 2,000 architects, covering the amount of work on their boards or under serious consideration for this year, and from these figures through a series of weighting factors, the forecast figures given here were established.

There has been no deviation in the method of developing the forecast, and because this method has produced successful results for so many years, it would seem obvious that no drastic change in its operation could be expected this year unless some unusual series of business conditions had developed suddenly to change the entire economic balance of the country.

If we seek further to analyze this apparently paradoxical situation, wherein many are predicting a sharp falling off of building in the year 1928, although most forecasts are to the contrary, we seem to discover controlling factors of an unusual nature, which after all may offer a simple explanation. It is to be noted that those who are making casual predictions anticipating a considerable decrease in the building volume are located in large centers where there is perhaps an over-built situation which would influence opinion. Perhaps the idea of decreased activity in the building field is a natural

1928 PREDICTION BY DISTRICTS IN 19 BUILDING CLASSIFICATIONS

BUILDING TYPES	N. EASTERN STATES	N. ATLANTIC STATES	S. EASTERN STATES	S. WESTERN STATES	MIDDLE STATES	WESTERN STATES	U.S.A.
Automotive	\$16,702,000	\$68,716,000	\$8,214,000	\$17,554,000	\$67,605,000	\$18,640,000	\$197,431,000
Banks	10,674,000	72,693,000	2,278,000	10,202,000	34,300,000	7,247,000	137,394,000
Apartments	10,437,000	347,500,000	13,862,000	22,400,000	186,400,000	72,230,000	652,829,000
Apartment Hotels	572,000	56,787,000	4,970,000	12,935,000	105,987,000	36,267,000	217,518,000
Club, Fraternal, etc.	10,557,000	46,287,000	2,937,000	15,000,000	86,742,000	14,440,000	175,963,000
Community and Memorial	3,146,000	13,400,000	580,000	5,265,000	41,760,000	10,645,000	74,796,000
Churches	19,860,000	48,740,000	12,635,000	20,900,000	71,367,000	37,640,000	211,142,000
*Dwellings (Below \$20,000)	19,780,000	76,730,000	8,700,000	16,360,000	49,400,000	26,372,000	197,342,000
Dwellings (\$20,000 to \$50,000)	11,420,000	69,210,000	7,935,000	12,150,000	37,610,000	24,640,000	162,965,000
Dwellings (Over \$50,000)	8,700,000	44,935,000	6,720,000	11,345,000	31,210,000	16,660,000	119,570,000
Hotels	21,487,000	107,272,000	19,950,000	45,175,000	105,200,000	42,917,000	342,001,000
Hospitals	22,724,000	104,210,000	8,715,000	21,320,000	110,114,000	39,200,000	306,283,000
†Industrial	18,215,000	79,362,000	7,100,000	12,222,000	121,000,000	22,917,000	260,816,000
Office Buildings	26,376,000	139,674,000	9,854,000	57,473,000	263,413,000	87,720,000	584,510,000
Public Buildings	24,207,000	122,761,000	4,893,000	17,869,000	132,171,000	28,900,000	330,801,000
Schools	42,371,000	197,613,000	36,827,000	46,282,000	163,413,000	82,666,000	569,172,000
Stores	11,780,000	54,776,000	5,103,000	8,086,000	39,763,000	26,713,000	146,221,000
Theaters (All Types)	21,920,000	43,114,000	4,167,000	3,777,000	71,620,000	17,340,000	161,938,000
Welfare Y.M.C.A., etc.	10,140,000	41,614,000	4,700,000	5,731,000	38,246,000	6,143,000	106,574,000
TOTAL VALUE OF							
NEW BUILDINGS	\$311,068,000	\$1,735,394,000	\$170,140,000	\$362,046,000	\$1,757,321,000	\$619,297,000	\$4,955,266,000
New Construction Under Architect's Specifications.....\$4,955,266,000							
As shown in above tabulation							
*Small Dwellings Not Designed by Architects.....							789,368,000
Estimated about 80% of total							
†Industrial Buildings Not Designed by Architects.....							260,816,000
Estimated 50% of total							
Other Buildings Not Designed by Architects.....							499,678,000
Estimated at 10% of total after deducting above two classifications							
TOTAL ESTIMATED EXPENDITURE						\$6,505,128,000	
FOR NEW BUILDINGS IN 1928						(Not Including Public Works and Utilities)	

reaction of the human mind which refuses to believe that good conditions can last so long. This is substantiated by the fact that most of those who are pessimists about building activity are also pessimistic about national prosperity. Of course, if general business conditions become straitened and the confidence of the public is shaken, building activity will be materially influenced. The volume of building construction, and particularly the volume of contemplated construction as expressed by plan filing, is not a *barometer* of business conditions, as it is so often called. It is a *mirror* of business conditions, and it does not primarily affect prosperity in one way or another, but is in itself an effect of our general business situation. In prosperous times we build in huge volume to meet not only the various necessary requirements for space but also to meet the requirements of a standard of commercial and domestic housing in keeping with ability to pay for greater comfort and utility,—an ever-improving standard.

With these thoughts in mind, is it not reasonable to believe that there may be a basic explanation for the evident paradox of contrary opinions as to building activity? Perhaps we have not been passing through a real "boom." Perhaps the continued building activity which, as an examination of the chart on the next page will show, has been going on in increasing volume since 1924, is primarily based on greatly increased building requirements coupled with prosperous conditions which have provided the means for this great investment. After all, the population of this country during the past ten years has been increased by many millions, for whom shelter of all kinds must be provided. The

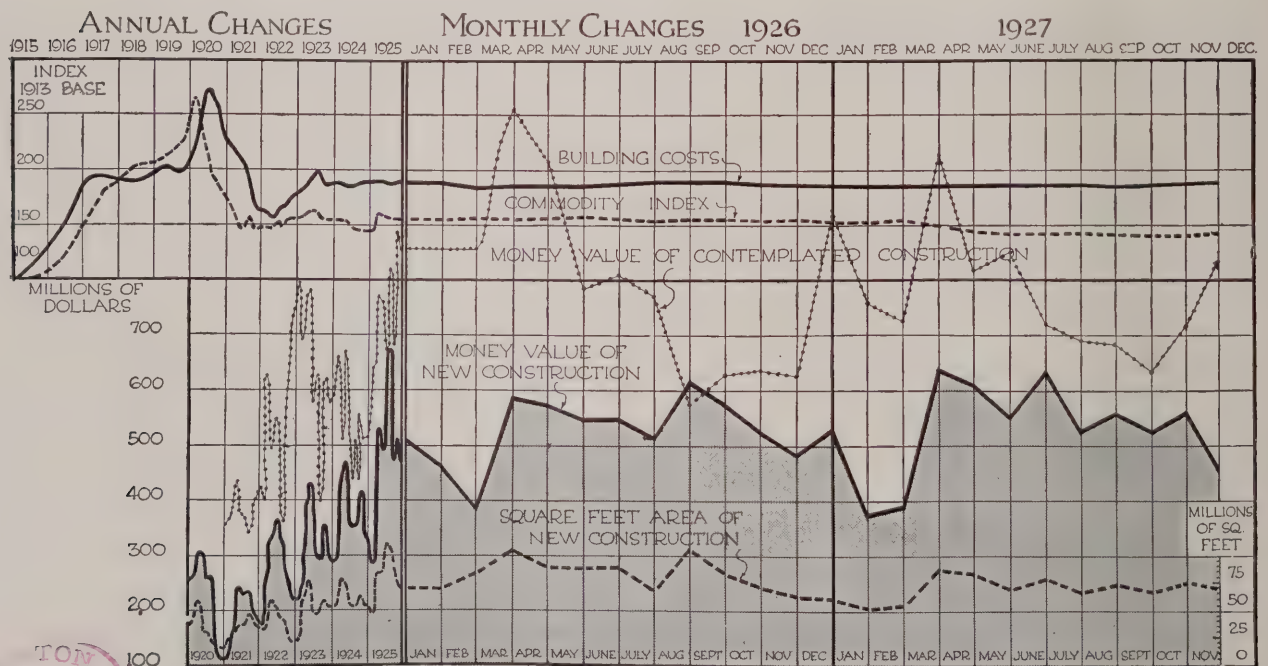
tremendous volume of existing construction which has been added to annually must of necessity require greater activity each year to take care of obsolescence and replacements. The fire losses grow greater annually, in spite of efforts to curb them, but it may be noted that they do not grow larger in proportion to the total number of buildings. They grow larger because the total area of risks has been greatly increased.

A COMPARISON OF PUBLIC DEMAND FOR NEW BUILDINGS AS SHOWN IN 1927 AND 1928

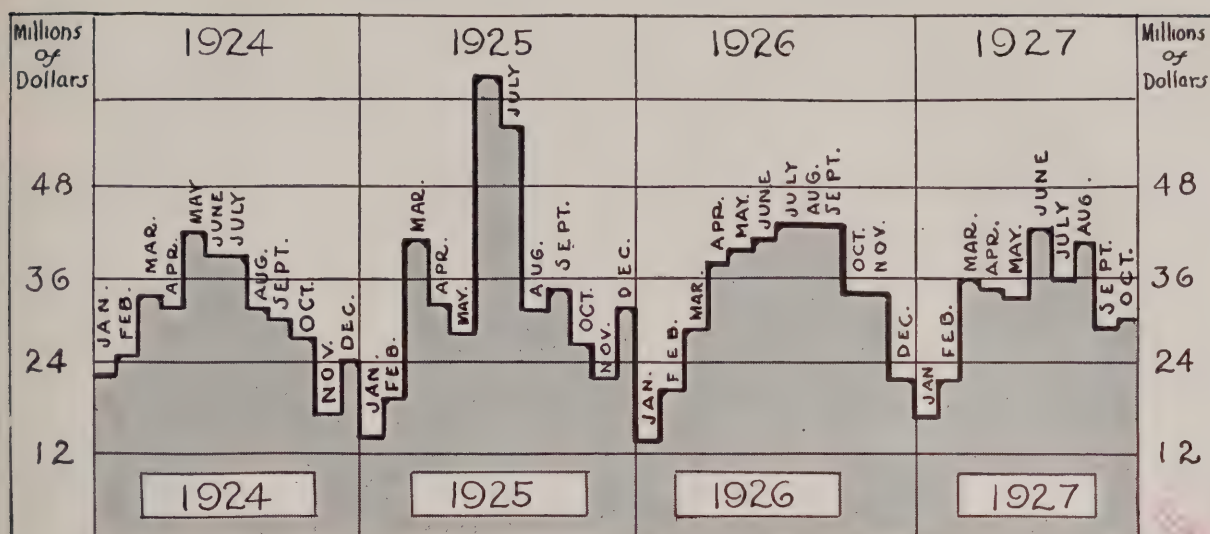
The figures given here apply to projects as reported by architects and represent the percentage of the valuation of each building type as compared with the total value of projects for the district.

NORTHEASTERN STATES

Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change
Automotive	2.5	5.4	+2.9
Banks	4.5	3.4	-1.1
Apartments	6.	3.3	-2.7
Apartment Hotels	2.	.2	-1.8
Clubs, Fraternal, etc.....	3.	3.4	+ .4
Community and Memorial.....	1.1	1.	-.1
Churches	10.9	6.4	-4.5
Dwellings (under \$20,000).....	3.	6.4	+3.4
Dwellings (\$20,000 to \$50,000).....	2.	3.7	+1.7
Dwellings (over \$50,000).....	2.	2.8	+ .8
Hotels	5.6	6.9	+1.3
Hospitals	4.8	7.3	+2.5
Industrial	11.9	5.8	-6.1
Office Buildings	8.9	8.5	-.4
Public Buildings	8.	7.8	-.2
Schools	15.	13.6	-1.4
Stores	1.4	3.8	+2.4
Theaters	5.4	7.	+1.6
Welfare, Y.M.C.A., etc.....	2.	3.3	+1.3



Here the building situation is shown at a glance. The various index lines are explained on the chart. This information is developed from reports of the United States Department of Commerce, the F. W. Dodge Corporation, and *The Engineering News-Record*



Four Years of School and College Building

NORTH ATLANTIC STATES

Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change
Automotive	2.1	3.9	+1.8
Banks	4.5	4.2	— .3
Apartments	18.5	20.	+1.5
Apartment Hotels	6.6	3.3	—3.3
Clubs, Fraternal, etc.	3.5	2.6	— .9
Community and Memorial	1.6	.8	— .8
Churches	5.6	2.9	—2.7
Dwellings (under \$20,000)	2.3	4.4	+2.1
Dwellings (\$20,000 to \$50,000)	2.2	4.	+1.8
Dwellings (over \$50,000)	1.9	2.6	+ .7
Hotels	5.2	6.2	+1.
Hospitals	7.1	6.2	—1.1
Industrial	7.5	4.6	—2.9
Office Buildings	10.9	8.	—2.9
Public Buildings	5.7	7.1	+1.4
Schools	8.1	11.4	+3.3
Stores	2.4	3.1	+ .7
Theaters	3.	2.5	— .5
Welfare, Y.M.C.A., etc.	1.3	2.4	+1.1

SOUTHWESTERN STATES

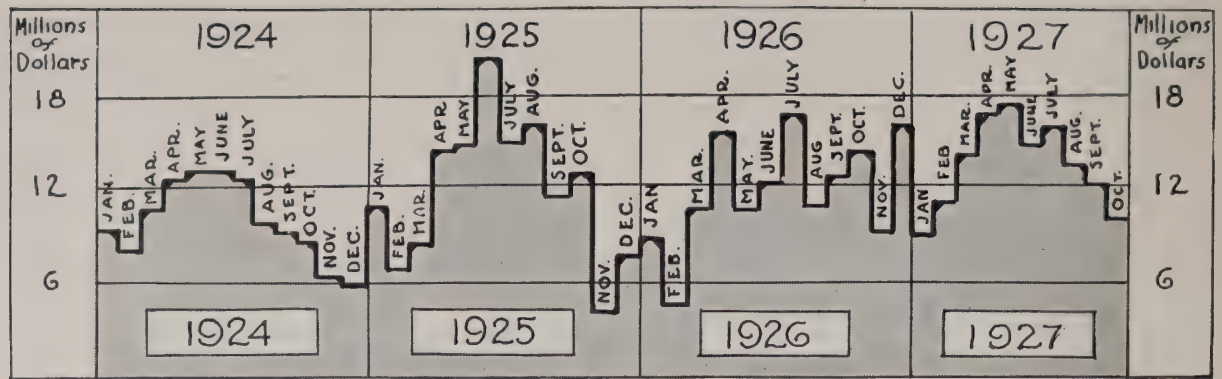
Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change
Automotive	2.8	4.8	+2.
Banks	2.	2.8	+ .8
Apartments	8.	6.2	—1.8
Apartment Hotels	2.	3.6	+1.6
Clubs, Fraternal, etc.	4.	4.1	+ .1
Community and Memorial	5.2	1.5	—3.7
Churches	10.2	5.8	—4.4
Dwellings (under \$20,000)	3.5	4.5	+1.
Dwellings (\$20,000 to \$50,000)	4.	3.4	— .6
Dwellings (over \$50,000)	1.5	3.1	+1.6
Hotels	10.8	12.5	+1.7
Hospitals	5.2	5.9	+ .7
Industrial	5.3	3.4	—1.9
Office Buildings	13.7	15.9	+2.2
Public Buildings	2.9	4.9	+2.
Schools	12.5	12.8	+ .3
Stores	2.	2.2	+ .2
Theaters	3.2	1.	—2.2
Welfare, Y.M.C.A., etc.	1.2	1.6	+ .4

SOUTHEASTERN STATES

Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change
Automotive	4.6	4.8	+ .2
Banks	2.3	1.3	—1.
Apartments	8.4	8.2	— .2
Apartment Hotels	3.2	2.9	— .3
Clubs, Fraternal, etc.	5.2	1.7	—3.5
Community and Memorial	1.	.3	— .7
Churches	6.9	7.4	+ .5
Dwellings (under \$20,000)	4.	5.1	+1.1
Dwellings \$20,000 to \$50,000)	4.2	4.7	+ .5
Dwellings (over \$50,000)	1.1	4.	+2.9
Hotels	15.	11.7	—3.3
Hospitals	5.	5.1	+ .1
Industrial	2.	4.2	+2.2
Office Buildings	5.	5.8	+ .8
Public Buildings	4.	2.9	—1.1
Schools	13.8	21.6	+7.8
Stores	8.	3.	—5.
Theaters	4.	2.5	—1.5
Welfare, Y.M.C.A., etc.	2.3	2.8	+ .5

MIDDLE STATES

Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change
Automotive	3.2	3.8	+ .6
Banks	2.6	1.9	— .7
Apartments	10.	10.	+ .6
Apartment Hotels	3.	6.	+3.
Clubs, Fraternal, etc.	5.	4.9	— .1
Community and Memorial	2.	2.4	+ .4
Churches	6.	4.1	—1.9
Dwellings (under \$20,000)	2.	2.8	+ .8
Dwellings (\$20,000 to \$50,000)	2.4	2.1	— .3
Dwellings (over \$50,000)	1.1	1.8	+ .7
Hotels	5.7	6.	+ .3
Hospitals	4.9	6.3	+1.4
Industrial	8.6	6.9	—1.7
Office Buildings	16.6	15.	—1.6
Public Buildings	4.	7.5	+3.5
Schools	13.6	9.3	—4.3
Stores	1.6	2.3	+ .7
Theaters	5.8	4.1	—1.7
Welfare, Y.M.C.A., etc.	1.9	2.2	+ .3

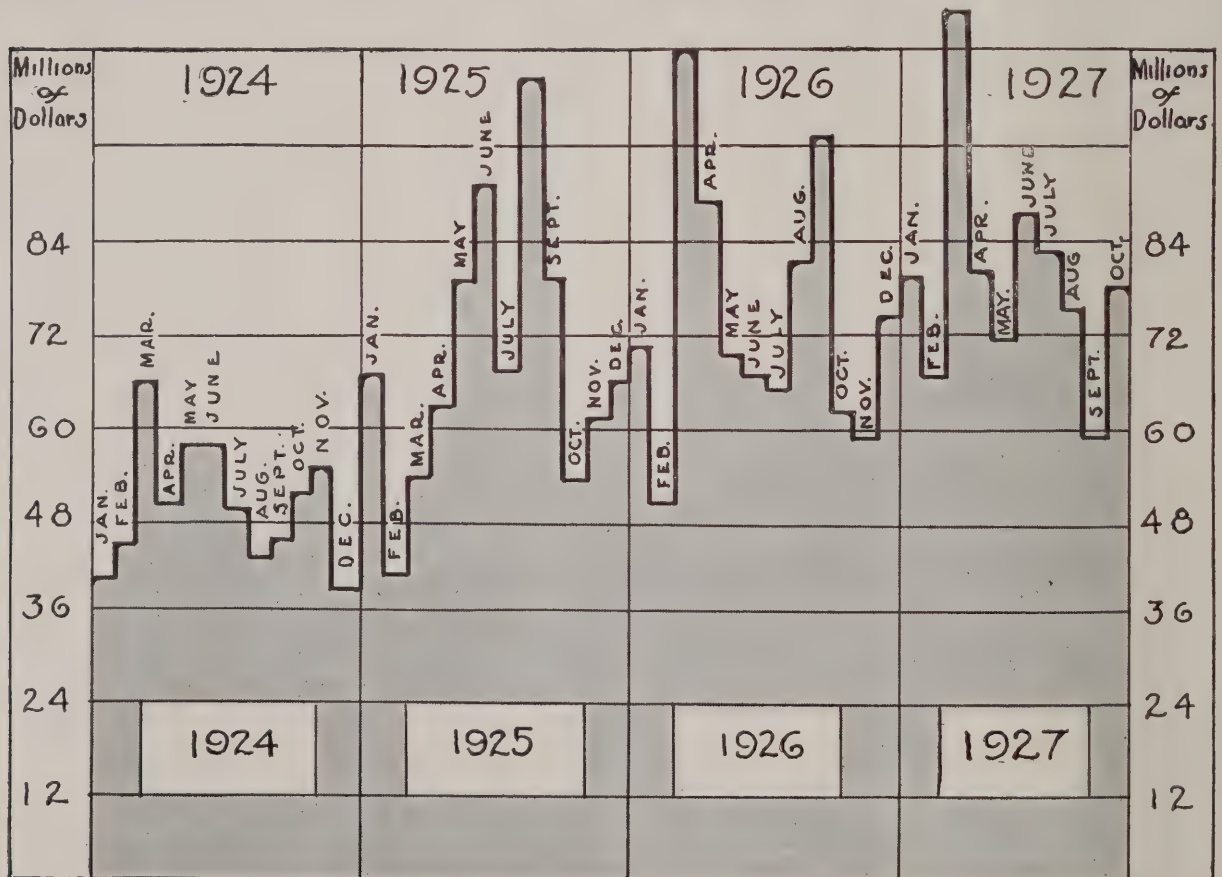


Four Years of Church Building

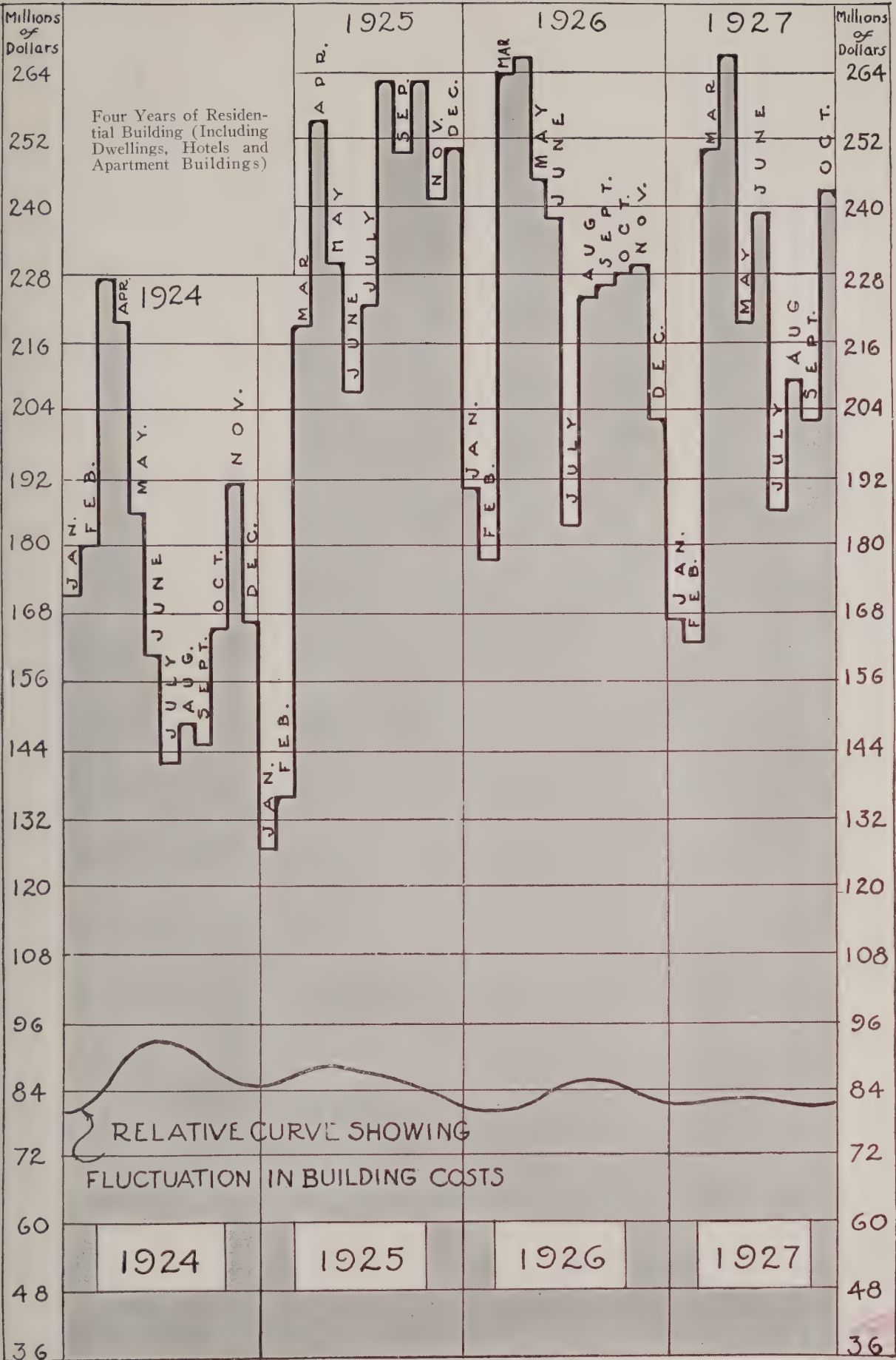
WESTERN STATES

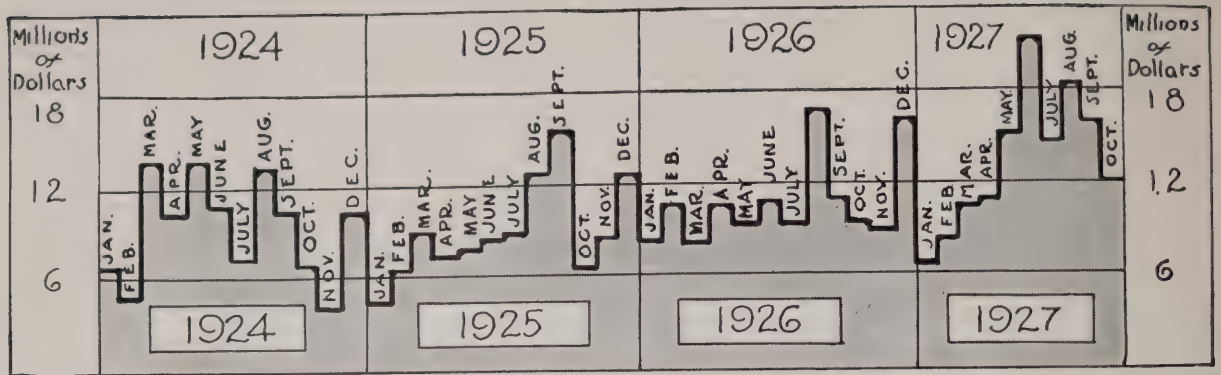
NATIONAL PERCENTAGES, U. S. A.

Type of Building	Requirements for New Buildings by Percentages			Type of Building	Requirements for New Buildings by Percentages		
	1927	1928	Change		1927	1928	Change
Automotive	3.6	3.	-.6	Automotive	2.8	3.9	+1.1
Banks	2.	1.2	-.8	Banks	3.3	2.8	-.5
Apartments	9.8	11.7	+1.9	Apartments	12.5	13.2	+.7
Apartment Hotels	4.3	5.9	+1.6	Apartment Hotels	4.3	4.4	+.1
Clubs, Fraternal, etc.	6.3	2.3	-4.	Clubs, Fraternal, etc.	4.3	3.5	-.8
Community and Memorial ..	1.9	1.7	-.2	Community and Memorial ..	2.	1.5	-.5
Churches	6.2	6.1	-.1	Churches	6.5	4.3	-2.2
Dwellings (under \$20,000) ..	3.	4.3	+1.3	Dwellings (under \$20,000) ..	2.4	4.	+1.6
Dwellings (\$20,000 to \$50,000) ..	2.3	4.	+1.7	Dwellings (\$20,000 to \$50,000) ..	2.4	3.3	+.9
Dwellings (over \$50,000) ..	1.9	2.7	+.8	Dwellings (over \$50,000) ..	1.9	2.4	+.5
Hotels	11.3	6.9	-4.4	Hotels	6.9	6.9	—
Hospitals	3.9	6.3	+2.4	Hospitals	5.6	6.2	+.6
Industrial	2.9	3.7	+.8	Industrial	7.3	5.3	-2.
Office Buildings	11.6	14.2	+2.6	Office Buildings	12.7	11.8	-.9
Public Buildings	9.6	4.7	-4.9	Public Buildings	5.6	6.7	+1.1
Schools	13.9	13.3	-.6	Schools	11.7	11.5	-.2
Stores	2.1	4.1	+2.	Stores	2.2	2.9	+.7
Theaters	2.4	2.8	+.4	Theaters	3.9	3.3	-.6
Welfare, Y.M.C.A., etc.	1.	1.	—	Welfare, Y.M.C.A., etc.	1.7	2.1	+.4

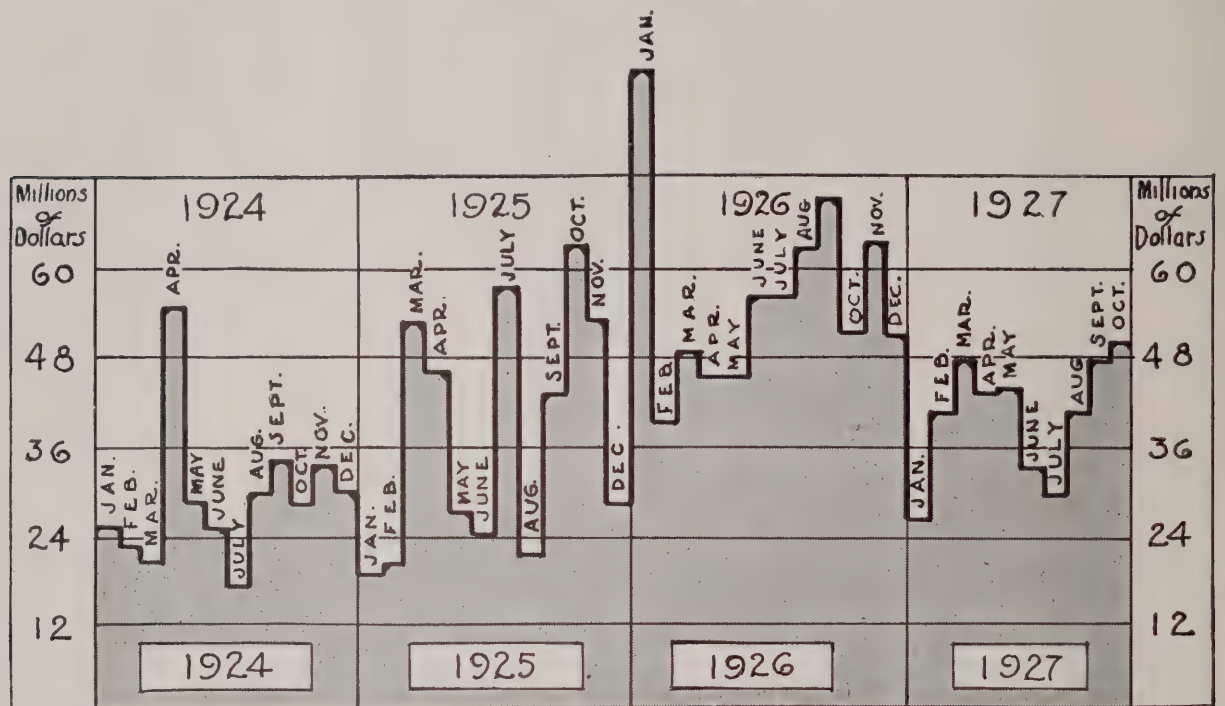


Four Years of Commercial Building

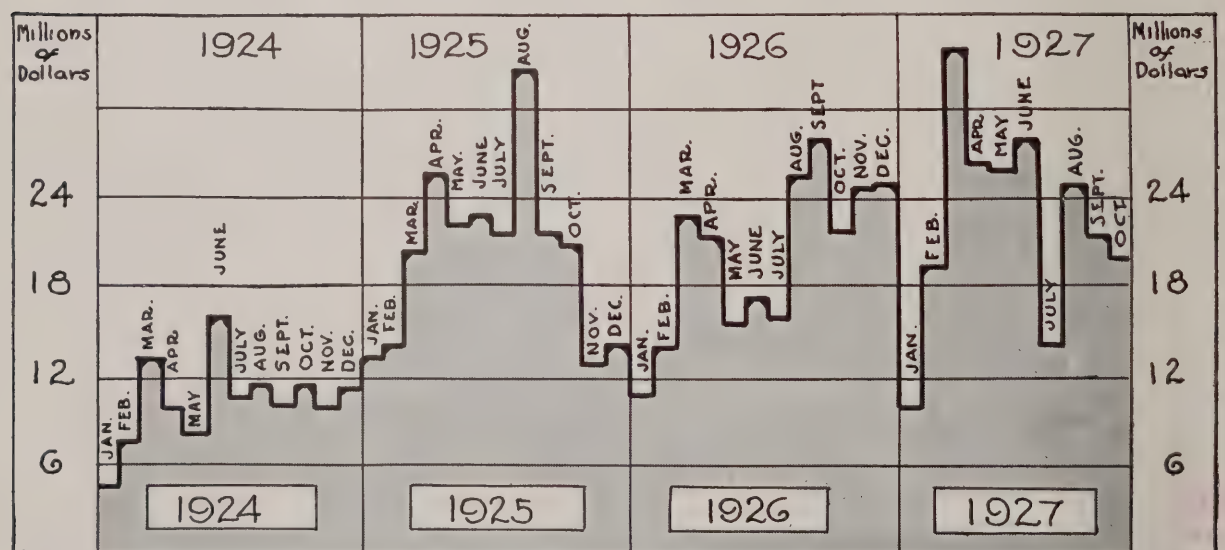




FOUR YEARS OF HOSPITAL AND INSTITUTION BUILDING



FOUR YEARS OF INDUSTRIAL BUILDING



FOUR YEARS OF CLUB AND FRATERNAL BUILDING

HOUSING—THE RESPONSIBILITY OF THE BUILDING INDUSTRY

BY

By JOHN TAYLOR BOYD, JR.

ALYMAR EMBURY II has done real service to architects and to the building industry in joining, in *THE FORUM* for October, those who are calling public attention to the housing problem. One may disagree with him in some respects, but there is certainly no exaggeration in his gloomy picture of the failure of the building industry to master the situation. One may regret, however, that Mr. Embury did not mention the success of the huge housing operation of the Metropolitan Life Insurance Company as casting a bright ray of hope across the dark scene. For architects and their fellows in the building industry, the most pertinent fact is that they are responsible for the failure and for the disastrous effects which may react upon them if they do not repair this failure, and as promptly as possible.

I propose here to point out the extent of the failure of the building industry in housing, and its possible consequences. In so doing I shall confine myself to the economic and architectural side of housing, and shall avoid the sociological aspect. Not that the sociological aspect is not important. It is important, and in the design of an actual housing operation, the bearing of the sociological side on the architectural design must be clear to the architect employed. On the other hand, in a general discussion of housing, I believe that architects, builders and real estate men will do well not to stray too far into the sociological field, for it has many pitfalls, and is far removed from our usual experiences. In fact, I have seen a gathering of real estate managers, who were called together to discuss the management side of housing, become so tangled in sociology that they could not think intelligently of their own part in the problem. It was as if a group of architects, called together to offer general suggestions on hospital architecture, attempted to decide problems of medicine; they would no longer be acting as architects, but as laymen.

In confining ourselves to our own part in housing, the first essential is to realize that the building industry is one of the basic industries of the nation, and that it is responsible for providing a clear majority of the American people with sound homes, of standards suited to American habits of living, and that it is the function of the architects to design the houses which the building industry constructs. If we architects do not understand that we have this task before us, there is little point in our discussing housing as an architectural matter. But if, on the other hand, the building industry does see that providing housing is its work,—just as it is the task of every basic industry in the American economic organization to supply the need for

its particular product among a majority at least of the population,—then architects and builders will understand that the failure in the housing field is put up to them to make good. And I believe that the building industry will make good the failure. I have enough confidence in my own profession and in the industry of which it is a part to feel sure of that. Having devoted myself to housing extensively since the war, I have practical reasons for my belief, but even if I had not, even if in every respect the situation seemed hopeless, I would still think that the men in the building industry had it in them to do the work. For to believe otherwise would be to mark out the building industry as different from all other basic industries, incapable of playing its part in American economy. The automobile industry has succeeded in providing nearly every American family with a car. Ten years ago that would have seemed too absurd to be taken seriously, and only five years ago the "saturation point" in automobile manufacture was a familiar topic. Shall it be said that the building industry cannot supply the American people with homes?

First comes the "scope of the work," as the specification reads. The problem is nation-wide throughout industry. Exceptions are confined chiefly to a few favored localities where construction costs and site costs which are well below average go hand in hand with high wages. More specifically, practically all the housing, of any type whatsoever, constructed since the war is produced only for the upper economic third of the population. It is the other two thirds,—the majority of the population,—which it is the task of the building industry to reach. Here, in this statement that houses must be built for two-thirds of the population, is the size of the undertaking that awaits the industry in the next few years.

Let us realize what this means to us in the building industry,—an opportunity greater than any previously open to us, or a failure which will be disastrous on an equal scale. If we rise to the opportunity, there will be a huge increase in building, including the construction of other buildings as well as of houses, a great construction period lasting for ten years at least, which will sustain general business prosperity in this country during that time, in so far as general business depends on construction activity for its prosperity. Does this sound visionary? Well, I gave this statement together with many figures to that organ of conservative finance and economics, *The Wall Street Journal*, and the *Journal* printed them on its own editorial authority last June in two half-page articles on housing. In these articles housing economics—not

sociology—was considered. Of course, the facts and figures had been shown to various experts who had not differed from them. I did not picture in the columns of *The Wall Street Journal* the consequences to the building industry of failure. It may do no harm, however, to point them out here!

Of course, as everyone knows, the neglected majority of the population which the building industry fails to provide for does not go without homes. It still depends on the supply of old houses. These houses are obsolete, sub-standard in countless instances, and are in use, in a terrible state of depreciation, long after their normal "economic" life is ended. They are the slums which form blighted areas in our towns and cities, causing grave social and civic problems. All this, again, is well known, but what the building industry overlooks is the evil consequence to itself. The custom of using houses beyond the term of their economic lives clogs the real estate market with second-hand goods, slows down the normal rate of replacement, and impedes the efficient flow of building products from manufacturer to consumer. I use, of course, the example of the motor industry, whose extraordinary efficiency in supplying a good automobile to practically every family in the country, and whose huge profits made in the operation, should be models for the building industry. The point is, that if the motor industry has trouble with its "used-car" problem, it is nothing compared to the dilemma of the building industry with the "used-house" failure. Yet does the building industry really know that it has such a problem as the "used-house" on its hands?

But there are other evil effects on the building industry of its failure in housing. These may be more remote, perhaps, but they should arrive in due time. When one of the half-dozen or so of the basic industries of the United States fails to supply the public's needs, sooner or later the public brings that industry to book. The experience may not be pleasant,—for the industry. Need one do more than refer to a number of episodes in recent industrial history, namely, the difficulties of the railroads, banks and the industries of food products, coal, petroleum, and some others? There is something in the recent growth of "commission government" in this country which may concern the building industry, particularly in the founding of the Interstate Commerce Commission, the Federal Reserve Act, the Federal Trade Commission, and various other utilities, commissions, boards, etc., along with the various legislative acts which govern their work of supervision. Are all these government administrative bodies opposed by the businesses which they regulate? And were not practically all of them so opposed when they were first established? There is significance in these developments, particularly in respect to the 1926 New York State Housing Act.

The New York State Housing Act, designed to secure high-standard, low-cost housing, is the first of its kind. I believe that the building industry

has nothing to fear from this law and others like it which may follow it in other states,—provided that the building industry coöperates. More of that later. But I do suggest that if the building industry does nothing to retrieve its failure to supply a basic need of the nation, building and real estate may suffer from many a government regulation and exaction which are harmful. Indeed, there are certain signs of public antagonism, stimulated by experts and influential citizens who have no connection with the building industry and who entertain little sympathy with it, but who are thoroughly informed as to its deficiencies. Thus the good will of the public for an industry,—that invaluable asset,—is being lost to building. The millions of dollars spent in advertising are not properly backed up in delivering the goods; probably the advertising of construction products would bring greater results if houses for everybody were produced as motor cars are produced. By contrast, the public loves the efficient motor industry, and will do anything for it, even to getting itself killed and maimed by thousands each year in order to provide room on the streets for the motor cars.

In this connection I think that Mr. Embury is unduly alarmed when he writes of "state aid." Indeed, he uses the term so loosely that I cannot quite grasp what he means. Strictly speaking, there is in the New York State Housing Act "state coöperation," but no "state aid" in the form of government subvention, no more than in the Federal Reserve Act, which Wall Street looks upon as one of the props of the financial universe. Possibly Mr. Embury refers to tax-exemption. Now, tax-exemption is an incident in housing, not a major feature. Besides, the tax-exemption provision in the New York law is carefully safeguarded. It rests with the municipality, and in New York the exemption is allowed for the purposes of replacing obsolete housing properties. Also, the exemption applies only to the new buildings to be erected on the sites, not to an entire housing investment. Consequently, its effect is to maintain the rate of taxes which were formerly paid on the site. But, in any case, whatever we think of the principle, there is nothing radical about it. It is sound American practice to grant a government subsidy in order to start a new essential industry when private enterprise has failed. What else were the federal grants of land to the railroads, given after the Civil War, made for the purpose of opening up the Far West? Since the World War the government has demonstrated the economic need of using the inland rivers for transportation by operating a large line, under Mr. Hoover's active sponsoring. Similarly, the government organized the air mail lines which are now being turned over to private companies. Lastly, there is the tariff, mother of many a lusty infant industry. Many of these steps, although supported in conservative circles, are more radical than the New York Housing Act. But if they are un-American,

then President Coolidge is the prophet of Lenin!

The principle to be deduced from these precedents appears to be that government may be expected to interfere in the American economic organization in order to establish a new industry or to reorganize an industry which is failing to live up to its responsibilities in coöperating with our industrial system, but that the government is ready to step out as soon as private enterprise in the industry is ready to function. I have steadily opposed the idea of "government housing," which is rife in housing circles, but I am not blind as to what is likely to happen if our industry remains inefficient in the housing field. A significant instance in this connection is the recent vote amending the New York State constitution, facilitating a municipality's use of land condemned for a public improvement (such as a traffic street widening) for housing. Actually, the amendment is a technical detail involving necessary legal powers in city planning. The question as to whether this power will be wisely used can be settled only in the future as specific projects are undertaken. But the point of the matter is that the people thought they were voting to order the slums cleared. Political placards urged votes "For Decent Housing," and newspapers carried headlines of "Slum Clearance Amendments." The amendment was carried by a large majority, reaching about 7 to 2 in this city. Such a vote is a temptation to a demagogue who sees an opportunity for making political capital. Housing is in politics now and is likely to stay. Let us take warning. If the building and real estate interests feel obliged to leave initiative in housing to the government, at least let them be ready to take housing back from the government as soon as possible.

I trust, if the building industry can view housing in this light as a practical economic opportunity and responsibility, which it owes to American industry, instead of as a strange sociological problem which can never be solved, that it will act to retrieve its failure. It is a mistake to view the problem in terms of history, quoting the example of ancient Rome and of most other great cities before and since, and ending by dismissing housing as hopeless. Our rival, the motor industry, made no such mistake. Fortunately for it, it deals with a product which has no history. Henry Ford, in fact, has declared that he does not believe in history! There was no precedent based on the experience of the Romans with motor cars to confuse Mr. Ford with notions that "it could not be done." Doubtless this freedom aided Mr. Ford in conceiving his crazy idea that practically every American family could own a decent automobile. Although he did not believe in history, he did in magic, and he was right!

Now, as a practical matter, what is the outlook for a solution of the housing problem today? Fortunately, I believe it correct to say that real progress has been made, both in estimating the extent of the work and in the experience which has been

gained in actual housing operations—although, as I have already suggested, it would make no difference in the responsibility resting on the building industry if there were nothing hopeful to report in progress made. In the first place, there is the Metropolitan Life Insurance Company's housing in Queens, now entering its fifth year of successful operation. It rents for \$9 a room a month with the aid of the first tax-exemption awarded in New York, or without benefit of exemption at the rate of about \$10.50 a room a month, including steam heat, hot water and dumbwaiter service. The Metropolitan housing returns over 8 per cent net to the insurance company, for interest and amortization on—let this be emphasized—a *100 per cent equity*. There are several other housing operations in New York, notably those of the Standard Oil and of the Rockefellers. They were built on a smaller scale than the Metropolitan, with the idea of demonstrating certain principles of housing technique rather than of attaining the low Metropolitan costs. Nevertheless, these other housing groups rent for considerably less than the market in their neighborhoods. These building are facts which the most prejudiced person cannot brush away. It seems reasonable to think that the solution of the housing problem depends in large measure on continuing to produce building groups like these of the Metropolitan Life Insurance Company and the others. This being true, it devolves on the building industry to show why it does not coöperate in this object. This appears to be the gist of the problem.

Why are not more housing operations like the Metropolitan groups built? "Because the speculative builder cannot make enough money out of it" is the answer. That may be the answer why the work is not undertaken, but it is no reason why the building industry should continue to throw up the task. If the work is too much for the speculative builder, let someone else be found to tackle it. Indeed, it is only fair to say that the methods of the speculative builder automatically rule him out of the picture. His methods were developed for another kind of houses,—the homes of the upper third of the population, the owners of the Rolls-Royces and the Buicks. They are impossible for Fords, and it is Fords we are now concerned with. The methods of the speculative builder for handling low-priced housing have been given the most thorough technical and scientific study as to their adaptability to housing, and nearly everyone who has studied housing is agreed on that point. The possible exception is the heads of the National Housing Association, who apparently differ in this view only to the extent of saying that the speculative builder should be depended on for housing, but they seem unable to advise him how he is to do the work. The fact is that the methods of the speculative builder are obsolete in a basic industry. The whole trend of American economic organization is in another direction. It lies toward huge-scale opera-

tions, efficiency, and a narrow margin of profit, but—and here is the point—*surer* profits, based on the elimination as far as possible of highly speculative risks. The fact is, that the same methods which are pursued by the speculative builder, if applied in other basic industries, would presently wreck the whole economic structure of the country.

Consequently it would seem as if a different type of organization, different particularly on the financial side, were needed in order to produce sufficient large-scale housing operations of the type of the Metropolitan Life Insurance Company and kindred enterprises—and much better operations as practice brings improvement—and thus end the housing problem for all but that extremely small number of people who cannot support themselves and who should rightfully be objects of charity. The New York State Housing Act was designed to facilitate this new type of housing corporation. And, be it noted, the law is just as helpful—and probably just as necessary—in the case of housing projected on the outskirts of cities, or in new industrial communities under a policy of decentralization, as it is in the congested areas in the hearts of great cities. For, generally speaking, the speculator is as unable to supply sound housing for even the middle third of the population on the outskirts of the city as he is at its center. This fact should not be overlooked, and I believe that Mr. Embury is in error in asserting that high wages in the building industry are the cause of the housing problem. I have taken part in countless calculations during the past year, as one of the consulting architects of the New York State Housing Board—long, accurate, painstaking studies—and know that the results of these researches bore out what had been fairly evident to housing architects,—that is, that high wages are not the cause of failure, except to a very limited degree. Of course, a reduction in wages would affect rentals, but not nearly so much as would the abolition of speculative finance. The Metropolitan's housing was built at the present wage level,—in fact, the construction operation was shut down for nearly a year because it could not afford to pay the wage bonuses then demanded. This delay increased the carrying charges. This leads me to agree with those architects who believe that capital and management in the building industry are in need of far greater improvement in methods than is labor.

Exhaustive research into land values, and into costs of various types of building construction, with reference to room sizes and specifications, studies of financial possibilities, including the tax factor and large scale operations with the amount of extra income to be derived from retail stores,—this the new Housing Board of New York found necessary before it could place before private building corporations the proper inducement to proceed to construct housing under the law. This research showed that there was a remarkable lack of accurate knowledge on certain phases of the subject. That criti-

cism sometimes heard of the State Housing Board, namely that in a year it has "done no building," only indicates a superficial acquaintance with the matter on the part of the cynics. We must be patient. In my own opinion, further research may be necessary, and may show that the law requires further amendment in certain of its provisions. This should not be wondered at, since the law is the first of its kind, and is necessarily experimental.

These are some of the vital facts in the housing problem today. Of course, there is much more to the story, which is one of amazing complexity, and never ends. But out of the welter of facts and conflicting views there stand out clearly the responsibility of the building industry and its duty to pursue the success of the first experimental housing groups. This means action, and action based on thorough knowledge. Knowledge can come only from scientific research, coupled with actual experience. Not only in housing but in other types of buildings, one vital need of the construction industry is scientific research into the economics of building design. We can hardly hope to play our part in the complex, technical, swiftly changing, industrial life of today unless we devote much more attention to research. Warnings have been issued by leaders in industry on the need of research. Examples have been given of huge American industries which have been ruined by changes which were never even thought of until they arrived. Scientific research would have discovered the possibility of these changes and found means to avert them or to cope with them, and so preserved the industry.

But, whatever be the solution, I hope that I have made clear my purpose of showing that the building industry will be held responsible for the failure in housing. Responsible business, financial and government authorities, as well as the public, will ask the building industry, why, if it is one of the nation's basic industries, it cannot do its part as the other basic industries do theirs, and supply efficiently the demand of a clear majority of the nation's 120,000,000 consumers. Either the building industry must tackle the task of providing housing seriously or else show, far more convincingly than it has ever done, that there is something inherent in its field, and different from other basic industries, which prevents it from following the modern economic trend. In either case the building industry faces the biggest task it has ever tackled. For the building industry, housing is not primarily philanthropy or sociology,—it is pure business.

In the providing of housing the architect must be active. The problem of design is uppermost in any angle of housing, and, in a long experience, I have seen almost no statistical study or research worth the paper it was written on which did not depend, in essentials, on an architect's counsel. Technically, the solution of housing depends on a scientific perfection of the "chemistry" of buildings, groups of buildings, and site areas, and is thus architectural in design.

OFFICE PRACTICE

SIMPLIFYING THE WRITING OF SPECIFICATIONS

BY

CHARLES E. KRAHMER

OF THE OFFICE OF GUILBERT & BETELLE, ARCHITECTS

DRAWINGS, specifications and contracts for a building are the tangible and concrete expressions of the development of an idea used to produce the structure desired in accordance with the building, business and legal practices of the community within which the building will be constructed. In the course of the development of the idea by the architect, it is interesting to note that the drawings in their various stages of development are prepared first. After the drawings are completed, the specifications are compiled. After an agreement is reached, based upon the drawings and specifications, the contracts are prepared. The contract is the written agreement to perform all of the work defined by the drawings and specifications, which when executed will legally compel one of the parties to complete all of the work shown on the drawings and covered in the specifications in return for the remuneration agreed upon.

Definition of Drawings. The drawings are prepared to illustrate those portions of the idea which it is impractical to convey by the use of the written word. Specifications are prepared to convey those portions of the idea which it is impractical to convey by the use of the drawings. Usage has within reasonable limits defined the function of each. The drawings should clearly and accurately indicate:

- (a) The architectural and engineering design.
- (b) The plan, sizes and dimensions of each portion and unit of the work.
- (c) Designation of each portion, so as to allow reference to it.
- (d) A symbolic sign illustrating the extent to which each of the building materials will be used (cross hatching, etc.).
- (e) Notes:—These should be used carefully and sparingly and only as necessary to simplify the preparation of certain portions of the specifications and to clarify portions of the drawings which cannot otherwise be indicated. Notes can very easily be used to an extent where they are likely to contradict the specifications.

Definition of the Specifications. Specifications are designed to convey in writing that portion of the idea which it is impractical to convey by means of the drawings. The drawings and specifications complement each other. It is for this reason that the exact function of the specifications should be defined. The specifications should describe the organization, material and workmanship required from each and every unit, with a full understanding of the function of each, and in such a manner that in combination with

the drawings, these several results will be obtained:

- (a) An accurately detailed presentation of what is wanted.
- (b) An instrument forming an accurate basis from which estimates can be obtained on each and every unit and forming a means of establishing a trade agreement.
- (c) A document which, in combination with an executed contract, will legally compel the production of what was agreed upon.

The specifications should be designed keeping in mind that these different individuals are very much interested in each portion:

(a) *Supervisor of Construction.* This official is the "policeman" on the work. It is his duty to interpret and enforce all of the provisions of the specifications. He, therefore, should be backed with a definite, complete description of what is required, not be subject to contradiction, and be forceful enough to support his decisions. The descriptions should be clear and accurate enough to prevent the necessity of having recourse to interpretations.

(b) *Estimator.* This individual desires a document accurately subdivided, with each trade inclusive, and prepared with an understanding of the market, and the trade and labor organizations in the community, to allow him to obtain accurate estimates for any portion of the work.

(c) *Materialman.* This functionary desires standard grading rules of materials and methods of construction, so that he can quote upon exactly what is wanted. The specification should be prepared so that special and unusual materials, difficult to obtain, are not required.

(d) *Contractor.* For success in his work he requires a safe, strong and sure basis, upon which to execute his various sub-contracts without fear of the necessity of paying extra for items in other portions of the specifications which should have been included under the proper trade designation.

(e) *Draftsman.* It is necessary that he have enough detail, definite data and names of materials, to intelligently check shop drawings and to prepare details.

The Precedence in Authority. The Supreme Court has ruled that where the contract documents contradict one another, the contract is impossible of execution and is, therefore, null and void. It is for this reason that contradictions between plans and specifications should be avoided and that one of the documents should take precedence over the other. The drawings are prepared first, after which specifications are compiled; then the trade agreement is made, and

the contract is prepared and executed. It is for this reason that the procedure is reversed in the matter of precedence, the contract taking precedence over the specifications, and the specifications taking precedence over the drawings. A statement to this effect should be included in the specifications and contracts.

Specification English. The question of the use of English should be carefully considered in the preparation of specifications, as the proper use of the moods and tenses, sentence construction, diction and grammar, should be such as to convey exactly the meaning intended. The American Institute of Architects uses the simple future tense of the imperative mood consistently. I believe this adaptation is correct, as it is undoubtedly the intention that the contractor shall furnish "such and such" materials or labor, for which the owner will pay "such and such sums of money," and will bind each other accordingly.

Division of Trades. Specialization with the building trades is highly developed and penetrates into each and every trade to an extent not dreamed of a generation ago. The list of trade sections of the New York Building Congress includes 56 different divisions, many of which are sub-divided within themselves, so that it is possible for 100 different sub-contractors to be employed on one operation. The Building Trades Employers' Association of New York issues a handbook which lists the various awards made in jurisdictional disputes between the different labor unions. This handbook is a valuable guide to the scope of work performed by each trade, and it forms the basis for the inclusion of the materials and labor in their proper trade divisions. It is the architect's duty to evolve an efficient working plan, utilizing the various sub-divided trades as they are now organized to function. The only way by which this can be satisfactorily accomplished is by means of the specifications. First, by means of the General Conditions, the entire organization, method of control, scope of work and system of constructing the particular building are covered, after which the amount of work expected from the general contractor is clearly defined. Then the scope and class of work and quality of materials for each separate trade or trade division are clearly defined, without omission or overlapping. The trade divisions are listed in the sequence in which each individual trade performs its work upon the building. The list of trade sections of the New York Building Congress furnishes an ideal means of trade divisions for the Metropolitan district, but it may not apply in localities where the trades are not so intensively organized.

Sources of Information. The specification writer is in effect a clearing house for all information affecting building materials and their use. The scope of a modern specification prepared in one of the larger offices is beyond the experience and knowledge of any one person. Therefore, it is of the utmost importance that the specification writer discover and develop reliable, progressive, and authoritative

sources of information. They may be roughly divided into these four parts:

- (a) The individuals comprising the architect's organization.
- (b) Contractors, sub-contractors, materialmen, material and labor associations.
- (c) Catalogs and trade magazines.
- (d) Personal visits to the work to obtain first-hand information.

The most reliable and often the most fertile field of information consists of the personnel of the architect's organization. The specification writer should make the proper contacts, so as to select those whose experience and knowledge are of value. The architectural designers should be familiar with the textural finishes of walls, woods, roofs, types and kinds of brick, stone, slate and wood of the various architectural periods; and should advise him of materials, colors and textures desired for the proper interpretation of the designs. The supervision department forms the "eyes" of the organization, and the specification writer should consult it at all times about the practical use of the materials specified and the subdivision of the trades. A close contact with the supervision department is of the utmost importance, as it is often called upon to interpret the meaning of the specifications. Another source of valuable information is found in the estimators, contractors, sub-contractors, and materialmen visiting the average office. It is wise to interview those who have serious business, and to appraise and classify those having the desirable character, contacts, training and experience. These men are able to lead one "back stage" to obtain a "close up" of the inside workings of the various trade, labor and material organizations which is invaluable. The contacts so developed create, in effect, an advisory board on the different phases of building construction which will enable one to obtain authoritative, reliable and valuable data on any subject. Salesmen who are merely "order takers" and "lip salesmen" are a nuisance, and no time should be wasted on them.

Another source of information, and one that is developing rapidly, is formed by the various material and trade associations, such as the Copper & Brass Research Association; the Portland Cement Association; the Common Brick Manufacturers' Association; American Face Brick Association; National Lumber Manufacturers' Association; American Institute of Steel Construction; the National Association of Ornamental Iron & Bronze Manufacturers; etc. These associations are created to develop and extend the use of the products or trades they represent, and are in a position to furnish accurate, scientific and common-sense data on all questions relating to their trades or products. The Bureau of Standards of the Department of Commerce has touched on many questions affecting the specification writer. For instance, their pamphlet No. 123 covering the physical and chemical tests of the commercial marble of the United States; the circular No.

NEW YORK BUILDING CONGRESS
LIST OF TRADE SECTIONS FOR SPECIFICATIONS

- | | |
|---|--|
| 1. SPECIAL CONDITIONS: (Conditions, not actual work). | 57. IMITATION MARBLE: |
| 3. MISCELLANEOUS WORK: (Items of actual work to be done). | 59. TERRAZZO:
Marble Mosaic. |
| 5. DEMOLITION: | 61. TILE: |
| 7. EXCAVATION:
Filling, Grading. | 63. CARPENTRY:
Framing, Millwork, Screens, Weather Strips, Rough Hardware. |
| 9. PILING: | 65. SPECIAL WINDOWS:
Rolled Metal, Hollow Metal, Patented Operation. |
| 11. SHORING:
Sheet Piling, Underpinning. | 67. HOLLOW METAL DOORS AND TRIM: |
| 13. FOUNDATIONS: | 69. METAL COVERED DOORS AND TRIM: |
| 15. STRUCTURAL STEEL: | 71. SPECIAL DOORS:
Revolving, Balanced, Folding, Rolling Shutters. |
| 17. WATERPROOFING BY PLASTIC COATING: | 73. SHOW WINDOWS: |
| 19. WATERPROOFING BY BITUMINOUS MEMBRANE: | 75. HARDWARE: |
| 21. MASONRY AND CONCRETE MATERIALS:
Cement and other basic materials, Integral Waterproofing. | 77. GLAZING: |
| 23. MASONRY WORK:
Mortar, Brickwork, Rough Stone Masonry, Structural Terra Cotta, Gypsum Blocks. | 79. MAIL CHUTE: |
| 25. MASS AND REINFORCED CONCRETE: | 81. PAINTING:
Wall coverings. |
| 27. CONCRETE ARCHES AND FIRE-PROOFING:
Reinforced Concrete Stairs, Hangers. | 83. DECORATIONS: |
| 29. CUT STONE WORK: (Granite and Bluestone should generally be separate).
Stone Models, Carving. | 85. PLUMBING:
Gas Fitting, Fire Lines. |
| 31. IMITATION CUT STONE: | 87. SPRINKLER SYSTEM: |
| 33. ARCHITECTURAL TERRA COTTA: | 89. VACUUM CLEANING SYSTEM: |
| 35. ROOFING AND SHEET METAL:
Skylights and their Glass. | 91. REFRIGERATION SYSTEM: |
| 37. VAULT LIGHTS: | 93. WATER SUPPLY SYSTEM: |
| 39. ARCHITECTURAL IRON: | 95. SEWAGE DISPOSAL SYSTEM: |
| 41. ARCHITECTURAL BRONZE: | 97. HEATING AND VENTILATING:
Temperature Control. |
| 43. CEMENT FINISH: | 99. POWER PLANT:
Coal and Ash Handling, Cranes, Engines, Dynamos. |
| 45. SPECIAL PAVING:
Asphalt, Wood Block, Stone. | 101. ELECTRIC WIRING:
Signal Systems, Bells, Telephones. |
| 47. SPECIAL FLOORS:
Cork, Rubber, Mastic, Magnesite, Linoleum. | 103. LIGHTING FIXTURES: |
| 49. METAL FURRING AND LATHING:
Metal Beads. | 105. FIRE ALARM SYSTEM: |
| 51. PLASTERING:
Keene Cement, Stucco, Sgraffito, Wood Lathing. | 107. CLOCK SYSTEM: |
| 53. ACOUSTIC TREATMENT: | 109. ELEVATORS:
Power Dumbwaiters, Elevator Accessories. |
| 55. INTERIOR MARBLE AND SLATE:
Structural Glass. | 111. ESCALATORS: |
| | 113. MECHANICAL CONVEYORS:
Pneumatic Tubes, Chutes. |
| | 115. EQUIPMENT: (Semi-independent:
This list may be extended indefinitely):
Kitchen, Laundry and Garage Fittings, Safes and Vaults, Furnishings, Tower Clocks, Chimes, Bells, Greenhouses, Landscape Work. |

151 on "Wall Plaster, Its Ingredients, Preparation & Properties," and the booklet on the "Minimum Requirements for Small House Construction," are useful, and the information contained is gathered from the most authoritative sources. When catalogs are received they are quickly appraised and turned over to the catalog file. Those having desirable specification data are culled out, and the specification data extracted and filed in a separate system.

Filing Specification Data. A satisfactory method of filing basic specification data is by the use of stiff covered loose-leaf binders, $8\frac{1}{2} \times 11$ inches, with $1\frac{1}{2}$ -inch rings. These binders contain numbered indices using the corresponding numbers that the New York Building Congress utilizes for its trade sections, or the divisions determined by a similar local body. The printed form of the New York Building Congress forms the index for these bindings in this case. A copy of this printed form is shown on page 139. When desirable specification data are obtained, the trade designation is obtained from the index, and the data filed under the number assigned to it. This system allows the gradual accumulation and selection of important data, so that a complete reference library in loose-leaf form is acquired. These volumes are numbered and kept in a standard bookcase for constant reference and form in no sense a catalog file but contain basic specification data that are constantly referred to in the preparation of specifications.

Systems of Compiling Specifications. To eliminate the repetition of mistakes which occur in copying one specification from another, and the inclusion of data which would not apply to another, the "master specification" was developed. These specifications

also are designed to simplify the compiling of new specifications and to standardize the general construction practices of an organization. It will readily be seen that where an office works from a master specification, the various supervisors, detailers and contractors' estimators become familiar with the type and class of work specified. This knowledge will not only speed up and simplify work, but will eliminate a good many errors. The interpretation of the specifications gradually becomes standardized, and the various contractors can tell from past decisions what to expect. The advantages of a master specification are its being:

- (a) A check to prevent omissions.
- (b) A source of ready reference.
- (c) Means of recording the best experience.
- (d) A place where corrections can be made and repetitions of errors avoided.
- (e) A source whereby constant improvements can be made, keeping abreast of the times.

There are various methods used in compiling specifications. The three outstanding methods are:

(a) *Use of Old Specifications.* This method consists of the use of an old specification of a similar work as a basis. Starting with the "General Conditions," the paragraphs that apply to the new work are cut out and pasted in their proper sequence on a standard yellow pad. Where a paragraph does not apply, insertions in longhand are made directly on the pad so that a complete specification is had on yellow paper, consisting of paragraphs pasted on the paper, with insertions in longhand. These are then turned over to the stenographer who makes a rough copy, using double or triple spacing to allow inser-

SERVICE CONNECTIONS:

ELECTRICAL WORK - THREE-3

Service Conduits and Feeders:

The Electrical Contractor shall install the lighting (x) and power (x) conduit_ and feeders from service cutouts in building to point of service

(a) connections on _____, the conduit_ to be extended up the

(a) _____ not less than 15 feet and _____

to terminate in an approved waterproof conduit drop loop bushing as required by the Service Company. The feeders shall be, as specified under "Wiring" and sufficient length of cable shall be left at each end as required.

a-For overhead service specify: side of building.

" underground " " company's pole.

(x) indicates possible omissions.

Sample Card from a Card Index Master Specification

(Actual card is 5 x 8 inches)

tions, additions or changes. This "dummy copy" is then used for checking, and when complete is delivered to the stenographer for final typing. A development of this method is to paste the paragraphs which apply on the pad as just described, and where insertions occur a few notes are made. The subject matter is then dictated directly to the stenographer, who inserts the paragraphs in the proper spaces. Most of the trouble and dissatisfaction with architects' specifications can be traced to use of this method. The reason is, in choosing a specification which parallels that being written, one may be chosen that is from five to ten years old. The mistakes and vague and meaningless paragraphs will be continued, and frequently practices and materials that are out of date and off the market for years will be specified.

(b) *Card System.* The card index master specification generally consists of cards about 5 x 8 inches in size, filed in a standard draw file. A sample card is shown on page 140. These cards are filed in rotation according to the trade divisions used in the office in which the specification is being compiled, which should, of course, coincide with the practice in the community in which the work will be done. One subject is assigned to each card, and where the subject is too long for one card, the subject matter is continued on the opposite side, or sometimes two or three cards are used for one subject. The stenographer then copies the cards in their proper rotation, compiling a "dummy specification," using double or triple spacing for ease in making corrections. The "dummy" is used for carefully checking and correcting the work, and after this is completed it is turned over to the stenographer for final copying. The cards are then sorted. This is generally done by the stenographer, who makes the necessary erasures, cleans up the cards, and files them, so that they are ready for use again. The danger in this system is the tendency to put too much in the specification and to become too general in application. There is also danger of accumulating unnecessary data. Clauses are often put in a standard file which are used so rarely that they should be discarded. The file should be kept up to date. When this is done, the system is excellent and will well warrant the trouble and expense of installing and maintaining it.

(c) *Standard Sheet.* Realizing the shortcomings and limitations of the use of an old specification and the card index system, there has been developed what might be termed a combination of the two, and where an office specializes in one class of work, it is a simple and economical system to use. The system consists generally of taking those sections of the specifications which are easy to standardize, such as, structural steel, brickwork, reinforced concrete, cut stone, metal furring, lathing, plastering, cement floors, terrazzo floors, interior marble work, tiling, hardware, linoleum, etc., and preparing master specifications for them. These are mimeographed on thin paper similar to specification paper, 100 copies being obtained for each section. The system then followed

is to take these sections in their proper sequence and to utilize an old specification of a similar work as a guide, to work from the standard sheets, and compile the new specification as noted under the system for "Old Specifications." It has been found that by this system at least 40 per cent of the typing is eliminated. The "dummy specification" is completely discarded, the final copies being made at once, and portions re-written where necessary.

Those sections which are not susceptible of standardization are copied directly from an old specification, with the necessary new paragraphs dictated to make them apply. In many cases complete trade sections have to be dictated. With care, the subject matter can be segregated so that certain paragraphs will be standard and will not change. The subject matter which does change can be segregated on one or more pages, making it necessary to re-type only these pages. I believe this to be an ideal system, as the master specifications are being continually checked up and revised, so that there eventually is developed a master specification which fits one's particular practice and method of doing business. This system allows a gradual and continual development, cuts down typing expense at least 40 per cent, and forms a standard from which everybody in the organization works. Of course in all practices there will be operations for which this standard cannot be used. In that case, recourse is had to the old method of cutting and pasting the specifications; but wherever possible this is done by using the paragraphs from the standards rather than from an obsolete specification.

Specification Schedules. Where a building operation is very complicated, and where individual treatment of different rooms and spaces throughout the building is such as to make descriptive matter difficult, schedules are used. These schedules simplify the preparation of specifications and drawings. The system is generally operated in this way: Schedules are made of all rooms and spaces throughout the building. Schedules are made of all doors and door openings. Each door or door opening is numbered on the plans, and each room or space in the building is also numbered, the corresponding numbers appearing on the schedule. The schedule of door openings lists this information: 1. Size of Door, then, in order the type and kind of;—2. Door Buck; 3. Door Frame; 4. Door; 5. Trim; 6. Plinth; 7. Door Saddles; 8. Glass; 9. Transom; 10. Hardware. The schedule of finishes, lists: 1. Flooring, then, in order, the type and kind of;—2. Walls; 3. Base; 4. Ceilings; 5. Wainscots; 6. Chair Rails; 7. Picture Mouldings; 8. Number of special detail drawings.

The specifications applying to the use of the materials covered in the schedules could very easily be standardized, as no description of where the different materials occur is necessary, since the schedules determine exactly where use of all of the finishes occurs. This system simplifies the preparation of the drawings that make it unnecessary to mark the

page of the typewritten copy. It would ordinarily require one week to turn out a set of 200 pages. On re-runs for additional copies, the cost of printing would be about 50 cents a page. The disadvantage of printing is that cost is excessive and almost prohibitive when fewer than 50 copies are needed.

(e) *Mimeographing.* The use of the mimeograph process is a feasible method of duplicating the architect's specifications in the architect's own office, when 15 or more copies are required. In order for the architect to handle this work within his own office, it would either require additional employees or considerable overtime work. To mimeograph specifications within the architect's office would also require supervision to insure that the process was used correctly. To have specifications mimeographed by a public mimeographing shop, the cost becomes more of a factor. When between 30 and 40 sets are required, the cost of mimeographing would approximate the cost of blue-printing. Below 30 sets, the cost of mimeographing would exceed that of blue-printing, but the finished mimeographed sheets would have certain advantages over blue-printing which would be of value. The mimeographed set would be more compact and more readable. The chief advantages of blue-printing would be absolute accuracy, whereas, with mimeographing the accuracy is dependent upon the concern which does the work. Of course the stencil may be typed in the architect's office to insure accuracy. The typist who types the stencil must be accurate, and their checkers must catch such mistakes as are made. With blue-printing there is also the advantage that a few complete sets can be obtained in a very short time after the blue-printer has received the copy, whereas, with mimeographing, no sets can be obtained until the entire

work is completed. When a stencil is once put on a mimeograph machine, the entire number of copies must be run off. When these specifications are sent to a mimeograph shop, approximately a day to every 100 pages of copy must be allowed. For instance, on a 200-page specification, the architect can expect to receive the completed sets two days after the mimeographer has received the original. When more than 40 sets are required, the saving in cost by using the mimeograph process increases in direct ratio to the number of sets required, since it costs very little to run 25 additional copies when a stencil is once put on a machine, whereas, the cost of each individual blue-print remains constant.

Summary. Too much system can be used in compiling specifications. The method should come naturally, for if forced into an ironbound system, the specification writer is likely to concentrate on the method and not on the subject. The methods outlined here should be used with great caution and judgment, as they often will not apply to unusual work. No substitute exists for a thorough knowledge of the subject, and no standard will take the place of an experienced specification writer. Specifications have been referred to jokingly as "the best sellers." Considering the number of people and the organizations affected by good specifications, it should not be difficult to realize the creditable publicity which will accrue as a result of having them. Among the most important assets of a specification writer are common sense and ability not to be swayed too much either way, nor to take sides too strongly. He should keep a perfect balance and attempt to get the proper perspective so as to obtain a proper view of the whole project. It is well to remember that behind the materials stand the organizations that produce

SCHEDULE OF FINISHES

COURT HOUSE

SHEET NO. 2

SUBJECT	FLOOR			WALL			CEILING		BASE			WAINSCOT			CHAIR RAIL	PICTURE MOULDING	DET. NO.
Page of Specification	40	60	70	31	41	80	79	80	40	26	90	41	26	92	93	94	
OPERATION																	
FIRST FLOOR PLAN																	
Location	MARBLE	TILE	LINOLEUM	TILE	PLASTER	MARBLE	PLASTER	METAL LATHED & PLASTERED	PLASTER	MARBLE	CEMENT	OAK	MARBLE	TILE	OAK	OAK	OAK
Entrance Hall #101	X				X	X	X	X	X	X							20
Toilet 102		X		X				X	X					X			
Passage 103			X	X				X		X							
Office 104			X	X											X		
Judge's Room 105			X	X		X	X	X	X	X					X		20
Court Room 106			X	X		X	X	X	X	X			X				
Jury Room 107			X	X			X	X	X	X					X		
Stenographers 108			X	X			X	X	X	X					X		
Sheriff's Office 109			X	X		X	X	X	X	X					X		25

POS

PUR

Portion of a Specification Schedule; Finishes
(Conforming in size to specification sheets)



them, so that when one selects a material one selects the company which will manufacture and install the material. It is for this reason that it is wise to make contacts with responsible companies and specify their products outright, without "or equal." By this method a skeleton organization will be "built up," which will strive to supply the material specified. The morale of the entire building operation will be affected, and a good building will result despite the whims of the general contractor. "Or equal" has a legitimate use, particularly when one is specifying raw materials covered by standard grading rules, because anyone interfering with competitive business is running counter to the business trend.

The materials that enter into a building may be classified generally under two headings,—raw materials, and manufactured materials. Raw materials in general comprise those products created by nature and used in the condition in which they are taken from nature. These materials are generally wood; stone; and such basic manufactured material as steel, copper, cement, lead, tin, etc., which are included under this heading for the reason that their quality is stabilized and standardized, due to the resources,

equipment and finances backing them. Manufactured materials are generally paints; varnishes; water-proofing compounds; pitches; magnesite, mastic, rubber tile and similar floor coverings; chemical floor hardeners; cement products; electric clock systems; telephones; fire alarms; heating specialties; ventilating fans; thermostatic heat control; elevators, etc.

When specifying raw materials there is little need for looking behind the product, as the specification writer should be thoroughly familiar with them, and his training should qualify him to pass on these materials. He should know their grades, physical properties, adaptability, limitations, and costs. When specifying manufactured materials a different condition exists, as the specification writer must depend in large measure on the character and standing of the company behind the product, as these materials are generally as good "as the man who makes them." The human element enters into the quality of these materials to such an extent that the standing of the company behind the product is an all-important question to decide; the quality of the material itself very often depends entirely on this decision. The specification writer must learn what trade-marks mean.

Gen Conditions	<i>Court House</i> <i>Corn. 1115</i>
Gen. Cont Work	
Demolition	
Excavation	
Shoring	
Foundations	<i>Fire Insurance By Owner</i> <i>Compensation Insurance By Builder</i> <i>Public Liability Insurance " "</i>
Struct. Steel	<i>Time of Completion - 14 months</i> <i>\$ day</i> <i>Liquidated Damages = General Contractor 100 per</i> <i>" " Heating & Vent. Cont. 50 " "</i> <i>" " Electric Cont. 40</i> <i>" " Plumbing Cont. 20</i>
Waterproofing	<i>Method of Procedure</i>
Mason Material	
Mason Work	<i>Alt. Estimates #1 Preserving Exterior Marble</i> <i>" " #2 Restoring Interior Decorations</i>
Concrete, Arches	<i>Architects & Mechanical Engineers plans go out separately</i>
Cut Stone	
Roofing & Sheet Metal	
Archtl. Iron	
Archtl. Bronze	
Cement Finish	
Paving	
Special Floors	

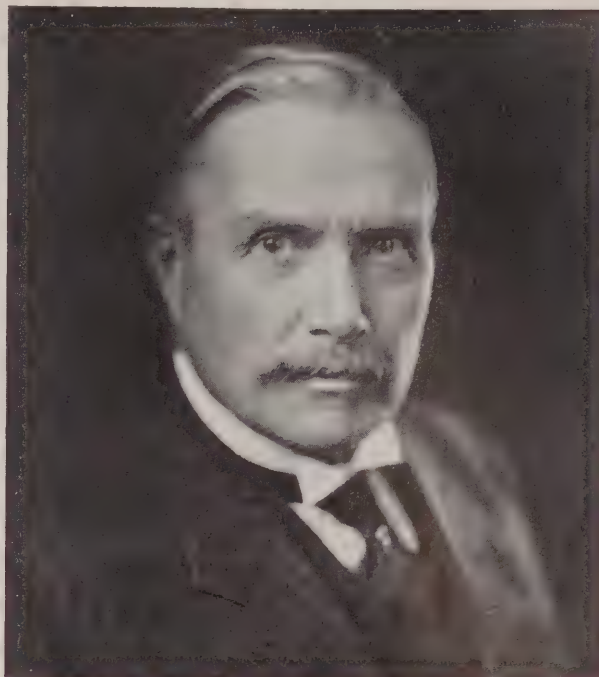
Facsimile of a Portion of the "Snake" Used by the Author

The original is a yellow pad $8\frac{1}{2} \times 11$ inches; indexes corresponding to Trade Sections are cut at the left. The architect can make his notes directly on the "snake" and can correct them before the specification writer compiles the specification. The method saves time and makes it unnecessary to read the entire specification.

JOHN PARKINSON: JOHN C. AUSTIN



John Parkinson



John C. Austin

JOHN PARKINSON is my friend, and the friendship is of long standing,—over 30 years in fact. We both came to Los Angeles in 1893, he as a practicing architect and I as a draftsman. John Parkinson left England for Canada when he was about 20 years of age, and from there drifted to Napa, in California. After a short sojourn in Napa, he went to Seattle. He stayed in Seattle for a few years and made quite a success, not only as an architect but as a financier. However, as with all other booms, Seattle's day of reckoning arrived. He therefore decided to try Los Angeles, and when he came with his wife and two small children, he had a capital of \$50. He designed the first structure having a steel frame in southern California, and has designed some of the largest and most important buildings here. He has a happy faculty of making good and lasting friends. He is a student, traveler, engineer, and architect. He is known far and wide for his sterling integrity and unflinching fairness in the execution of his business. John Parkinson has two aberrations, one being that he thinks he can play pool, the other being that he has the hope of becoming a golf champion. He has been actively identified with a good many civic activities. For a number of years, he was a member of the Municipal Art Commission, and he is still a member of the State Architectural Examining and Licensing Board. His son, Donald B. Parkinson, is a member of the firm, and they make a splendid team, one with his ripe experience, and the other with the enthusiasm of youth.—JOHN C. AUSTIN

IN March, 1894 I opened an office in Los Angeles. Its equipment comprised a drawing table, T-square, etc., a set of instruments of 14 years service, and about ten yards of brown detail paper whose surface was untouched but alert.

Minus commissions, prospects or capital, with pencil in hand, I stood behind the table, when in through the open door quietly walked John C. Austin, seeking work. I liked his looks,—a square face; firm mouth and good jaw; gray, intelligent eyes in which a twinkle hovered,—a man to hold his ground and fight fair, asking nothing but opportunity, and, I was to learn, a man of wit, courage and staying qualities, then about 25 years of age.

In 1894 he opened an office, and since then many of the prominent school buildings of southern California, among them the Los Angeles High, many office buildings, hotels, hospitals and churches, are of his work. He has a positive genius for handling church, school and hospital boards, and unfailingly inspires and retains the confidence of his patrons. He is a prominent member of the Chamber of Commerce; has served as president of the Jonathan Club and of the Los Angeles Chapter of the American Institute of Architects. At the present time Mr. Austin is associate architect of the Los Angeles City Hall, to date the city's most notable building. As an architect, a man, and for his record, he has my admiration and esteem, and I have valued his friendship always, since as a lonesome English lad, 33 years ago, he asked me for work.—JOHN PARKINSON

TIME SAVING IN THE OFFICE

BY

E. R. DUCKERING

OF THE OFFICE OF WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

THE title may suggest an attempt to squeeze a few more lines and erasures from a man trying to puzzle out a thumb-nail sketch of the entire results of a conference between his employer and the client. However, the writer is only offering a hint or two that may release a few drafting hours which are spent in unnecessary waiting and interruptions due to lack of readily accessible information.

A commission usually starts with an indefinite collection of data presented in such odd forms as illustrations scribbled on a hotel paper napkin, the obvious results of a luncheon hour conference, or even on a paper bag or the flap of an old envelope. Very often a client will rush in a batch of magazine clippings carefully selected by him to fit into your idea of just what his house should be. Few draftsmen take these clippings seriously, and soon they are tacked up on a table leg where the janitor can pick them off easily. Later on the client remembers these precious documents and demands their immediate return. No draftsman can remember ever having seen them, and the architect is forced to appease his client as best he can. This is a serious reflection upon the office, and it is easy to avoid by no extra effort. Criticism in the form of sketches by the architect or any chief should be kept where it can be produced readily. An idea of the expense of keeping a person waiting for data can be obtained by figuring the rate per hour and finding the exact cost of the moments wasted in useless hunting. If several officials are kept idle for only a short time, the amount involved is appalling. In one week a series of these retards will make a sum no one would fail to notice. A draftsman is often called upon to explain the origin of certain parts of his drawing which are only his interpretations of his chief's sketch. The boss calls immediately for the sketch, but it can rarely be found, and the crestfallen draftsman has only to listen to a lengthy description of his talents in interpreting the sketch into so unbelievable a monstrosity. Being unable to produce the original sketch, he has no defensive argument to offer.

To have a system whereby any scrap of information relative to a commission, whether it be note book references, photographs, or clippings, can be readily produced, is a time-saver for all. It will also relieve the air of a certain static in the form of a nervous tension which exists while the office boy is frantically trying to recollect where he last saw the drawing that is demanded. A legal size manila envelope affords a practical place to store all these bits of information. The envelope presents a neat appearance, and a collection of such envelopes can be

filed in alphabetical order or kept in a tracing drawer. The vertical file is most satisfactory because it keeps all the envelopes together. Mental peace of the force makes for a smooth continuance of work. A telephone call or discussion within earshot naturally tends to distract anyone who is in a mood for concentration. Arguments invariably disrupt the work of a man who is checking a set of figures. It is apparent that a drafting room free from searching parties, contractors seeking suitable reasons for extras, and others endeavoring to have drawings put into their own language is a place in which those who do feel inclined to concentrate can do so. It is not intended to condemn practical joking, for jokes do not constitute the lasting barrier to thought that an uneasy mental atmosphere engenders.

A great deal of time is spent in making details that cover either a large number of conditions or else a very few. Most offices give each drawing a number and a title that is fairly descriptive of what it is supposed to include. Rarely can one determine from the title all that the drawing covers. A very simple method for saving extra drawing and permitting the contractor to choose the correct detail with the minimum amount of effort is to put on the working drawings the number of the detail covering that particular section or condition. Certainly a drawing or sheet number is as easy to read as are quantities of notes, such as "see F. S. D." or any reference to another sheet. The existence of the number alone is sufficient to explain whether or not the condition is covered in a scale detail or a full-size, or perhaps in both. If a condition requiring a detail has no number, it has been detailed. Every drawing number should be recorded on the office copy of a set of working drawings as it is made. This forms a check on the progress of the detailing, and any person can soon establish the status of the work. Many contractors use this system of numbering on work as it is in progress, and it is quite as advantageous to a drafting room in saving hours of time spent looking for the number of the drawing covering a certain condition. Windows and doors have their numbers to make them easy to list and locate, and application of the same principle can be made to a uniform listing of drawings for anyone to read. A drafting room's set of estimate drawings will serve as a tell-tale record of exactly what the contractor figured on. This should be kept meticulously. When the results of several extensive erasures have cleared the ground for new ideas and corrections on the tracings, the original records will still be intact. Such records are often worth while if a lawsuit is threatened.

ARCHITECTURAL LAW

THE STANDARDIZING OF BUILDING CODES

BY

RUDOLPH P. MILLER

Consulting Engineer; Author of New York Building Code

WITH a growing consciousness in the public mind in recent years of increasing health hazards due to the housing shortage caused by the World War, and the greater fire hazards, frequently involving loss of life, due to greater congestion incident to a rapid development of urban districts, there has come a realization of the need of better regulation of building construction in the interest of public safety, health and general welfare. Over 100 municipalities of 10,000 or more inhabitants are at the present time revising their existing building codes, and more than a score of others report that they have such work in contemplation. The great activity in the zoning movement developed within a decade has, no doubt, greatly stimulated interest in better planning and construction of buildings, these two means of regulation being so intimately related that they really should be dealt with as one matter.

Every municipality, certainly when it has become an aggregation of 5,000 inhabitants or has become an active industrial center of even lesser population, should exercise some control over the erection of structures within its boundaries. The right of the individual to protection against deprivation of light and air by an unnecessarily full development of his neighbor's property, and against the fire hazard created by the unwarrantable use of combustible materials in construction, to mention only the two chief dangers arising from intensive development of land, should be properly safeguarded. But what of existing building codes? Is there any need of changing these? If they are ten or more years old, it can be safely asserted that they are in the main obsolete or, at any rate, inadequate. In recent years there has been extensive research, not only in connection with the development of new materials for building, but also with respect to the physical properties of old, well tried materials. The growing use of the former has forced a re-study of the latter to avoid complete replacement. Then, too, improvements calling for recognition have been made in methods of construction; better planning has been more or less retarded because of restricted requirements; greater differentiation in specific provisions seems desirable for varying conditions of occupancy. The chances are that any building code more than ten years old makes no provision for these developments.

The Old Code as a Specification

The old codes have been referred to as inadequate. That is not to be understood as meaning that they are not sufficiently detailed. The probabilities are that with respect to the matters dealt with, they go too much into detail. Their requirements generally are in the nature of specifications. If adhered to they leave no way open for a different, even if a perfectly safe, way of accomplishing the desired re-

sult. This tendency to make specifications of the codes still prevails. Existing codes are being amended to provide for use of new materials and new forms of construction by adding detailed descriptions of the materials and elaborate instructions for their use. As a result, such codes are becoming encyclopædias of building construction as practiced at the time of their adoption in the particular localities to which they apply. There are building officials who are advocating this type of a building code. They look to it as a *vade mecum* in which they expect to find the exact answer to each question as it presents itself. When the code fails to provide for a given condition, it means to them a prohibition of that proposition. So, too, there are architects who desire this type of building code. To them it serves as a text book from which they draw material for specifications and even the basis of their designs.

But the specification type of code has marked disadvantages, the chief of which is that it hampers development. With all requirements specific in their nature, practically fixing all details of plan and construction, little freedom and no incentive are left the designer to improve on the standards that are the result of the fixed requirements. Use of new materials or modes of construction is discouraged. Revisions and amendments can, of course, be made, but when these involve legislative action, the time lost will frequently cause the abandonment of the intended improvement or deprive an intending user of a new material or benefit of an economy that might be effected. The specification code also tends to creating indifference on the part of the architect, contractor and administrative official. With everything prescribed, or rather assumed to be prescribed, there seems to be no need for use of special intelligence in the application of the statutory provisions.

The Real Purpose of Codes

It is not contended that all the provisions of a building code can be general in character, but restraint should be as limited as is possible consistent with the protection necessary for the public. So far as practicable, depending on the facilities for accomplishment, the code should prescribe conditions of safety to be secured without fixing a specific method by which they are to be had. This is quite possible in those matters where quality of materials is standardized or where construction practices are well established. The quality of practically all of our building materials is fixed by standard specifications prepared with great care after thorough research by committees of national scope and competent personnel, such as the committees of the American Society for Testing Materials and the National Fire Protection Association. Construction practices too have received general recognition;

among them is the specification for steel construction promulgated by the American Institute of Steel Construction. There is therefore no real necessity for incorporating in a code these details that are so well known. The futility of endeavoring to include such detailed requirements for construction was illustrated once in some litigation over a brick wall. From its external appearance the wall appeared to be a good piece of masonry. The bricks were laid to line, with carefully struck, broken joints, and it complied in other respects with the details specified for brick masonry in the code. The interior of the wall, on the other hand, as described by a trustworthy observer who saw the work being constructed, consisted of bats with unfilled joints of mortar laid bone dry on an excessively hot summer day; and none of these details were dealt with in the code. The outcome was that, inasmuch as the specific requirements of the code had been complied with, and as the defects reported were not provided for in the code, and as the completed work had a satisfactory appearance, the wall was a lawful structure and there was no cause for complaint. Had the code simply called for good and acceptable workmanship in accordance with well established practice, it is almost certain that the court would have based its judgment on the testimony of qualified witnesses as to what constitutes good practice and would have found the wall deficient; and the owner of the wall would have had the redress to which he was entitled.

There are, however, many matters in connection with building construction that affect the public safety with regard to which there is either no recognized, established practice or regarding which there are still honest differences of opinion as to the safe medium requirements, so that it is necessary to deal with these in more or less detail. Such, for instance, is the matter of interior stairways; how many must be provided?—where shall they be located?—what shall be their width?—how shall the treads and risers be proportioned?—when and how shall landings be introduced?—shall winders be permitted?—shall the stairways be enclosed, and with what construction?—how shall the enclosures be lighted?—to what points shall the stairs lead and exit?—what about handrails and other details, which are many?

Administration of the Code

One circumstance which will determine in a measure whether the code provisions may be general in their nature, indicating the purposes to be attained, or detailed and specific in character, is the means provided by the municipality for administering the statute. If, as may be the case in the smaller communities, limited financial resources preclude the employment of a properly qualified technical man, or one having a sufficiently long and varied experience in the building construction industry, there perhaps it is better to prescribe in detail all that is essential for safe building. But this sort of ad-

ministration is suitable only where a few, old, well known materials are in use, where the buildings do not exceed two or three stories in height, and where there are not likely to be occupancies hazardous to life or property. It is rather difficult in these progressive days to conceive of any municipality that is content to restrict its development in this way.

For the proper governmental supervision of the building activities of any locality, the official charged with the administration should be informed on the nature and physical properties of building materials; he should be acquainted with current acceptable practice in the use of those materials; he must be capable of judging of the character of workmanship; he should be versed in the principles that underlie adequate lighting and ventilation of buildings; he must know the essentials of fire prevention; and he must understand the principles underlying planning adequate exit facilities. These things he must have mastered to the extent that he can speak with authority and will apply them with good judgment and reasonableness. In some municipalities the building official is also charged with the enforcement of statutes governing elevators, plumbing, electrical equipment, and smoke abatement. It is not expected that the official should be an expert in all these matters, but it does imply a knowledge of at least general principles of installation and operation. Such an official can be and should be clothed with the necessary authority to supply by regulations the detailed requirements which are not appropriately embodied in the code and which, if included, unnecessarily load up the statute with provisions that are likely soon to become obsolete, and which, depending on legislative action, are difficult to alter. If this appears to give considerable power to the official, let it be pointed out that authority goes with responsibility, and that there is no real responsibility where there is no authority. However small or insignificant the municipality in which he serves, the official should be clothed with a good measure of authority and responsibility anyhow, or else a low salaried clerk could fill the post quite as well. No matter how detailed the code may be, the official, unless he is a mere figure head, must to some extent exercise his own judgment in deciding whether a building operation conforms to the code, for it is practically impossible to meet every contingency in the code. If then the official has the qualifications, he may be trusted to pass on all the essentials for the accomplishment of the purposes to be attained.

The code itself should indicate the intent of the regulations that are authorized, should fix the manner of their promulgation, and should provide safeguards against arbitrariness in their adoption. To be legally valid, regulations must be limited to provisions for carrying out the intent of the statutory mandates; they cannot be in the nature of additional requirements. The intention might be appropriately expressed in the code so that, as far as practicable, the generally recognized standard specifications for

materials and rules of practice in construction as established by national technical organizations shall be accepted as, or at least used as the basis for, the authorized regulations. Such standards have already been referred to. It is not well to cite these by name in the code, as is sometimes done, as that may lead to confusion in the interpretation of the code. Formal public announcement that the promulgation of regulations respecting certain designated matters is contemplated should be required, and, if requested, an opportunity for a public discussion of the proposed regulations should be afforded before they become effective. Changes in the regulations should be made when necessary or desirable to keep them abreast of the times and to give to the public the benefits of improvements that may develop or of economies that may be effected in construction.

No Uniformity of Building Codes

At various times the question has been raised as to whether it is not possible to draft a building code that can be of uniform application. A satisfactory answer is difficult. It depends on many things. A reading of the various reports issued by the Building Code Committee of the U. S. Department of Commerce, a committee formed "in response to a generally expressed public demand for greater uniformity and economy in building code requirements," will show that complete uniformity is hardly attainable. Local conditions cannot be ignored in the preparation of a code, and these sometimes vary considerably with different localities. This same committee found, for example, that a standard of quality for brick that was reasonable in one section of the country would condemn as unfit a brick that has been in use for many years with a good service record in another section. Brick in various parts vary in strength. It would be manifestly unfair to fix the minimum wall thicknesses in accordance with the weakest product, thereby perhaps depriving those using a stronger grade of the economies to be had without sacrifice of safety in the use of thinner walls. Nor would it seem just to demand of the builders in regions where high winds have not been known that they build their structures, at increased costs, to meet the conditions of localities where violent storms are of frequent occurrence. Policy may dictate a different procedure or responsibility in the protection that should be given a neighbor's land or structure when excavation for a new building is undertaken in one or another territory. As already intimated, the facilities for enforcing the code would warrant varied requirements. J. E. Mackie, who as secretary of the Pacific Coast Building Officials' Conference was intimately in touch with the commendable effort to formulate the "Uniform Building Code of the Pacific Coast," in an address spoke of the difficulties encountered and referred to the opposition "in some quarters because of certain classification of occupancies, provisions of types of

construction, and departure from present accepted practice." His further statement that "perhaps no common basis can be arrived at in the case of the two former" gives another ground for doubt of the possibility of uniformity, due to some local policy.

Uniformity in Arrangement Desirable

There is one respect in which uniformity in codes is desirable, in the interest of convenience to the users,—namely, in the arrangement. Architects and contractors, many of whom are engaged in building in various places, would save much time and annoyance if, in consulting the codes of those various places, they could find the several provisions arranged in somewhat the same order. Two methods suggest themselves. They are thus described in the report of the U. S. Building Code Committee on "Arrangement of Building Codes." "The first takes up each major class of occupancy, as for example, office buildings, tenements, small dwellings, factories, etc., and gives in separate chapters a full statement of code provisions applying to each, even though this involves considerable repetition. Certain general matters, such as allowable working stresses, the quality and testing of materials, administration, etc., are treated in separate chapters without reference to occupancy. The second method classifies buildings by type of construction and gives the fundamental structural features of each type. Occupancies also are classified, and the general construction type necessary for each occupancy class is specified. This is followed by chapters giving the detailed requirements for each construction type and for other essential features, such as quality of materials, means of egress, etc., from which the requirements for each building may be selected."

It is by no means easy to decide which of these methods is the more meritorious. Each has marked advantages. As an example of use of the first method, the building code of Flint, Mich., may be cited. The second method has been followed in the building code of Cumberland, Md. After due consideration of suggestions and criticisms from scores of architects, engineers, buildings officials and others, the committee has recommended an arrangement based on the second method. For the details, the report itself, published by the Government Printing Office, at Washington, should be consulted.

Physical Make-up for Convenient Use

A few words on the structure or make-up of a building code would perhaps not be amiss. Such an ordinance is necessarily a voluminous instrument, especially when it embraces, as it should, all matters relating to the construction, alterations, repairing, removal, location, equipment, occupancy and use of buildings, including most of the provisions that are embodied in housing and zoning laws. With so many matters to cover, in an effort to make its pro-

visions readily available, an extensive subdivision of the text is desirable. Long paragraphs and involved sentences should as far as possible, be avoided. Ease of consultation should be kept constantly in mind. In this connection a comprehensive index, though not a part of the legislative statute, is highly desirable when the code is printed for distribution. Similarly, annotations and cross references at appropriate points in the printed copy add much to its usefulness. The building law frequently constitutes a part of a code of ordinances. As such it is properly designated a "chapter" of such a code. This chapter should be divided into major parts called "articles," numbered serially, each dealing with a general, broad subject, such as "1. Administration"; "7, Means of Egress"; "9, Construction"; "14, Elevators"; taken from the recommended arrangement of the U. S. Building Code Committee. In "sections," into which articles are divided, the leading items of the code are treated, as "Reinforced Concrete" under "Construction"; "Allowable Working Stresses" under "Materials, Loads and Stresses"; "Courts," under "Light and Ventilation"; "Permits," under "Administration." Each section should have a title as indicated, and the sections should be numbered serially from the beginning throughout the code, though not continuously; that is in the first article the section numbers will perhaps run to 7, then in the next article the section numbers should begin with 10, leaving the intermediate numbers for possible future additions, and so with other articles, in this way avoiding a general renumbering or the awkward expedient of a number and a letter (16A for instance) for the section. In some codes the section numbers start anew in each article. This makes it necessary in citing a section to mention the article number as well; it also makes it more difficult to locate the section when consulting the code. As far as may be desirable, for greater ease in finding particular provisions, the sections may be further divided into numbered sub-sections, and these again into lettered paragraphs, this making for convenience.

Conflicting Local Codes and Laws

A historical inquiry would show that the present more or less elaborate building laws have developed from the so-called "fire limits ordinances" that it was found necessary to enact many years ago, as the fire hazard increased with the more intensive development of land in the heart of a municipality. These fire limits ordinances were, in fact, our first zoning ordinances. They fixed districts within which, in the interest of public safety, no further building of frame structures would be permitted, in this way controlling to some extent the construction of buildings. In some cases these restrictions are embodied in separate ordinances, but as they deal with building construction, they logically are part of the building code. It has been the custom in the past to incorporate in the ordinances long, detailed

descriptions of the boundaries of the fire limits. This necessitates lengthy amendments when changes are made. The practice in zoning ordinances of referring to maps has never been questioned. The same medium could be employed to advantage in fixing fire limits. At the same time, provision might well be made for the extension according to certain definite principles, perhaps at stated periods, of such limits with the expansion of the congested areas, through public announcement by the administrative official. In many cities zoning ordinances have been adopted since the enactment or latest revision of the building code. The draftsmen of zoning ordinances have generally paid no attention to the existing ordinances affecting buildings and have fixed restrictions of height and limitations of area that are in conflict with provisions of the older statutes. To dispel confusion, revision is needed. This more likely would be avoided if the zoning ordinance were made part of the building code; it certainly would be a convenience to those designing buildings. What has been said as to the desirability of making the requirements of zoning ordinances part of the building code applies to housing laws with greater force. Their provisions for open spaces do not generally accord with provisions of either the building code or the zoning ordinance. What the proper minimum requirements for open spaces in the interest of public health and safety should be, is no doubt subject to debate, but it does not tend to hold the respect of the layman for the law when there are conflicting requirements of which he is uncertain as to the law he must observe. Nor does it increase his regard to find that there is somewhere a provision that, in the case of conflict, the severest requirement must apply, yet this is sometimes the case.

One of the most important features of a building code, one that, until the recent past, has been generally neglected, has to do with means of egress. Thousands of lives have been sacrificed because adequate exit facilities were wanting. Although much thoughtful study has been given the subject, especially by the Committee on Building Exits Code under the sponsorship of the National Fire Protection Association, a generally accepted practice has not been established, and for this reason rather detailed specifications are necessary in the building code.

The Need for Building Codes

To many persons, to engineers more particularly, a building code suggests only a set of rules governing the strength, stability and construction of buildings. But in respect to these matters rules of good practice are probably better established and more faithfully followed than rules regarding other matters dealt with in a building code. If it were not for the existence of irresponsible architects, incompetent engineers and unscrupulous builders, who unfortunately are permitted to ply their trade, very little provision in this connection would be needed.

THE ARCHITECTS' FORUM

A BUSINESS COURSE IN AN ARCHITECTURAL SCHOOL?

BY

WILLIAM A. BORING

PROFESSOR OF ARCHITECTURE, COLUMBIA UNIVERSITY

I AM asked if a business course is essential to the curriculum of a model school of architecture. A business training is useful and necessary for every man who has to make a living, who has to attend to his banking, to his investments, and to whatever he undertakes; it is not confined to practicing architects nor, on the other hand, should it be conspicuously left out of an architect's education. An engineer, a lawyer, a doctor, should know how to attend to business, but they are not supposed to learn this in college during the four or six short years they have to study their chosen professions. It is well known that no man is permitted to practice architecture under the registration laws until he has had two years' experience under a preceptor after graduation, and during that time he is supposed to learn those things which relate to the conduct of business and to avoid the errors revealed by the questionnaire on page 152.

Now every architect must keep some kind of accounts, but a young architect who starts in with the idea that he should use double-entry bookkeeping and put down all of his own time and the salaries of his men and overhead, and figure that out according to each commission, will never get far in good designing. Such work is done in most good offices by bookkeepers, as there are more important things for the architect to do in the practice of his profession. There are larger questions than those mentioned that really are much more important, such as giving the client the required data as to size and scope of a building operation measured by the cost; telling him the truth about his estimates, including an allowance for extras; representing in drawings the amount of good and complete buildings which the money will buy; shielding him from irresponsible contractors who will get him into trouble; avoiding sub-contractors of poor credit, who have liens filed against them. He must learn to make for the contractor honest working drawings which will carry the facts so that he will not make mistakes in estimates or construction. These things should be taught in the schools.

Specifications are taught to explain clearly in plain language what is intended to be in the building without copying the phraseology of someone else. General unnecessary inclusive clauses are not a part of the specifications, as he is taught. It is customary if a man is absorbed in design and cannot give the proper attention to the business side of his practice for him to secure a partner or an assistant who can very well attend to all the routine work, which is not difficult to accomplish with good, honest work and application. This leaves to the man who is espe-

cially fitted by endowment and education, as every good architect should be, entire charge of the creative side of the practice of architecture. In a man's early practice he can find time for ample study of works on legal questions which will guide him safely with regard to his responsibility and the nature of contracts. He can also study all kinds of technical advice on banking and bookkeeping and the laws of the land with regard to building and liens. It is not difficult for him to get any of the information which is suggested in Mr. Embury's questionnaire, by simply applying his mind to it in his off hours.

In schools of architecture the main thing is to give a man a thorough knowledge of architecture itself. Then after he knows how to design, to construct, and to draw out a building, he is given a high ideal of his duty to the profession, to his client, and to the contractor. He is taught that he must be first of all a man of honor, and must take no chances whatever in handling his client's affairs, which must always be done with diligence and accuracy. Of course an architect who cannot control others, who has no power to delegate work, who tries to do everything himself and is his own bookkeeper to boot, is going to run upon the rocks. An architect does not have to take a business course in order to handle his practice successfully. Schools of architecture must teach design, first and foremost. In order to teach design they must give sound training in drawing, practical construction, and the theory of writing specifications and making working drawings. A certain amount of time should be spent in the study of buildings under construction, the general theory of contracts, and the best methods of carrying on a building operation.

The schools of architecture exist to teach men things that they cannot learn so well or so quickly in any other way. They teach them, above all things, how to design good architecture; that the foundation must hold, and the roof keep out water; the chimney must draw, and honest supervision must be exercised. They advise him that he should work under a preceptor at least two and a half years to acquire practice, just as a young doctor does his hospital work before he goes into practice for himself. It is during these years of apprenticeship in a good office that he should learn the practical and business side of the profession. It has never seemed to me either advisable or necessary to put into the already crowded curriculum of his course the subjects of business and practice. Architecture is essentially a fine art, and the schools are right in treating the subject as such and in training their students to design.

ASK ME ANOTHER

BY
AYMAR EMBURY II

EDITOR'S NOTE:—As the business side of an architect's practice has become more and more important and voluminous during the past 15 years, the question is often raised as to the propriety of including in the curriculum of the modern architectural school a course on business practice as pertaining to the architectural profession. The deans of our numerous schools of architecture seem to take the stand that there is no time or opportunity for the inclusion of such a course in the curriculum of their schools. Many maintain that such a course has no place in an architectural school.

There is no doubt about the value in obtaining the varying points of view of leading architects and educators on any mooted subject pertaining to the profession. It is interesting, therefore, to obtain opinions on a subject such as this, however diverse and opposed they may be. It was for the purpose of obtaining such differing opinions that THE ARCHITECTURAL FORUM requested both Mr. Boring and Mr. Embury to give an expression of their opinion as to whether a business course should be included in architectural schools. The brief article by Mr. Boring, who takes the negative point of view, precedes this amusing questionnaire by Aymar Embury II. Mr. Embury believes that the questions, answered correctly, prove his contention that architectural schools should include a business course. Put down your answers to Mr. Embury's "Ask Me Another" and determine for yourself whether he is justified in taking the affirmative side in this debate.

1. Should an architect keep books?
2. Do you know how to keep books?
3. Where did you learn?
4. Is yours a good method?
5. How do you know?
6. If an architect is paid by a note, can he discount it?
7. Can a contractor discount a note?
8. If a contractor is paid by note and the note is not met, should your certificate show the amount as unpaid?
9. If an owner gives an order for additional work direct to the contractor, should its cost be included in your certificate as extra work?
10. Are you responsible for its proper execution?
11. Can you charge a commission on it?
12. Do your draftsmen keep time cards?
13. What do you do with the time cards?
14. Are your traveling expenses charged to the commissions?
15. Are your telephone calls charged to the commissions?
16. Do you charge overhead?
17. Do you know what your overhead is?
18. How do you know?
19. What is overhead?
20. How do you proportion it to your commissions?
21. If a draftsman does jury duty, is his salary paid?
22. To what account is this charged?
23. Do you know how to write a contract?
24. Is a verbal contract binding?
25. Can you alter a contract once made?
26. Can a written contract be altered verbally?
27. When is an extra binding on the client?
28. Can you order an extra verbally?
29. Can the cost of an extra be collected from you?
30. Why?
31. Have you a contract with your client?
32. If a client comes into your office and orders sketches, does he have to pay for them?
33. What is a mechanic's lien?
34. Who can file one?
35. Can a lien be filed by a contractor?
36. By a mechanic working for a sub-contractor?
37. What is a sub-contractor?
38. Can the architect order changes in the work of a sub-contractor?
39. How?
40. Can an architect file a mechanic's lien in New York? In New Jersey? In Texas?
41. If he can, when can it be filed?
42. Should a general contract be filed with the county clerk?
43. Why?
44. Must you have a license to practice architecture?
45. Can you make drawings without a license?
46. Can you superintend without a license?
47. How do you know?
48. Suppose that you are building a house with three sub-contractors and the work of one of them is damaged by some undetermined party,—who pays for the damage?
49. Should you be paid for changes in sketches?
50. Should you be paid for changes in drawings?
51. When does a sketch become a working drawing?
52. What is "substantial completion"?
53. If a front door lock is unsatisfactory to the client, can he hold up the last payment to the contractor and yourself?
54. Where can you learn about these things?
55. How did you find out where you could learn about these things?
56. Would you have saved money if you had known about these things before you began practice?
57. Could your instructors in college have told you where to find out?
58. Could they have told you what was important?
59. Would it have taken them long to do it?
60. Should they have done it?
61. Could they have done it in one hour a week for one term?
62. Is such a business course desirable?

F. A.

THE ARCHITECTURAL FORUM

IN TWO PARTS



PART ONE
ARCHITECTURAL DESIGN
FEBRUARY
1928

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Published Monthly by
ROGERS & MANSON COMPANY
383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Robert Sweet, Sec. and Treas.; Paul W. Hayes, Asst. Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, \$7.00. Canada, \$8.00. Foreign Countries in the Postal Union, \$9.00

Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat
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BOOK DEPARTMENT

SOME EARLY NEW ENGLAND GRAVESTONES

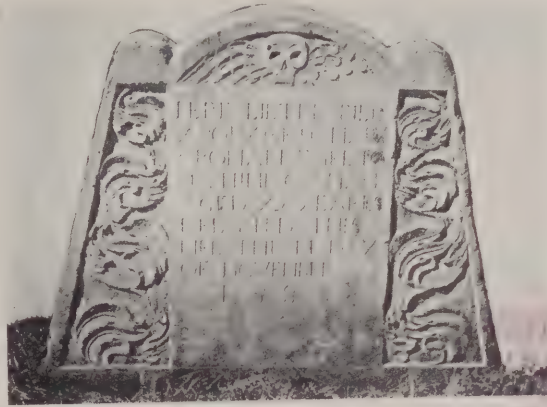
WEAR and tear of centuries and the constant destruction of the old to make way for the new have left but comparatively few examples of the work of early American architects, sculptors, and carvers. Here and there one will find still existing an old residence or an archaic church which has somehow managed to escape destruction, but of sculpture and carving there is little, and that little is chiefly in old graveyards or "burying grounds." Perhaps these tiny little plots, which are many in the older communities, are the only spots which the early craftsmen would recognize could they return today to visit the scenes of their earthly careers! These old tombstones or gravestones possess in many instances highly architectural distinction along with their archaeological interest, more than a few being equal in merit to the tablets, cenotaphs and other similar objects carefully treasured in such well known and historic buildings as King's Chapel in Boston or in St. Paul's Chapel in New York.

This work deals with some of the venerable headstones in the little burying grounds of certain parts of New England, places which were among the earliest settlements,—Boston, Cambridge, Dorchester, Duxbury, Marblehead and Ipswich, among others,—and with the craftsmen who cut into stone the archaic figures and the often beautiful lettering that in so many instances seem to defy the ravages of time. "The artistic handicraft men had more orders on the occasion of a rich man's death, than ever his life afforded. Death was the source of their richest rewards and greatest inspiration. The deathly trappings of the funeral horses, the pallbearers' embroidered gloves, the mourners' rings, the escutcheons, now are gone. The gravestones alone remain. To our day they stand, shoulder to shoulder, in hundreds of New England graveyards, the one unchanging record of the Puritans' reverence for death, and appropriately enough, the most lavish and original of all their artistic endeavors. The colonists used their finest skill and raised their most enduring and characteristic works of art in *memento mori*, and death alone called forth their highest efforts.

"Everything that they made, their houses, churches, pewter, tableware, furniture, is 'seemly' and often beautiful. But upon the furniture, the silver or brass, they lavished no such originality or creative force of decoration. Not even in their early paintings is there expressed any conscious philosophy or attitude toward life. In the carvings of the gravestones, often very beautiful, always thoughtful, we meet the most characteristic expression of the Puritan as artist. What the totem pole was to the Alaskan Indians was the gravestone to the first six generations of New Englanders. It seems to me there can be no serious consideration of him as an artist

or thinker without some study in this field. We have little other sculpture from his austere hand, and yet upon the graves,—as is shown in these illustrations,—are many admirable contemporary portraits, arrangements of flowers and fruits almost *renaissant* in their richness and beauty; there are ships cut in stone with the rigging of the day; even Jehovah Himself is pictured rolling up the

firmament; in Newport, and also elsewhere one may see Adam and Eve standing naked and ashamed. Incidentally, the lettering used is often of extraordinary purity and charm of proportion. Today there is none of the harshness and starkness of death in the ancient burying grounds of old New England. Perhaps because the Puritan lived so in the presence of the Black Angel, he came to have little fear of him. With St. Francis, he might have addressed him as 'my brother, the death of the body.' The



A Gravestone at Salem, 1683

French, so often called a gay people, make their cemeteries morbid and repellent to the living, but the grave and other-worldly Puritan accepted death with such passionate faith in a better world to come that we may believe that his fears were quieted. His sunny hillside burying grounds with their carved stones remain to this day peaceful and blessed spots, small and restful oases."

The value of the work from an archaeological as well as a historical point of view is considerable, but its importance to architects will be chiefly on the side of design; it suggests a point of view which is original and fresh and which might well be interesting and useful to architects who are called upon to design work which is of a more or less sepulchral character. Then again, much might be learned from a careful study of the lettering in which these stiff and old fashioned epitaphs are recorded. Old American sculptors and even ordinary stone cutters well knew the value of fine lettering. It was before the day when lettering and type had become classified and named, and the work of these early craftsmen possesses that charm and interest which attach to any form of artistic effort which is spontaneous and original. The volume is evidently the result of endless search and research, and the author has found and preëmpted a field which is peculiarly her own. The work might be regarded as one manifestation of a movement toward securing present-day appreciation of the work of American craftsmen of a bygone age,—their architecture, building, furniture making, and whatever else entered into their lives. This movement has done much and is likely to do more to improve modern work; modern design in this field affords opportunity for improvement.

GRAVESTONES OF EARLY NEW ENGLAND, AND THE MEN WHO MADE THEM. By Harriette Merrifield Forbes, 141 pp., 7½ x 10½ ins. Price \$12.50. Houghton Mifflin Co., Boston.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

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CLASSICAL ARCHITECTURE. *By C. Howard Walker.*

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THE Committee on Education of the A. I. A. has produced this volume for use as a textbook in American colleges, and for general reading and study by the public, with the purpose of arousing interest in the fine arts and creating a better understanding and appreciation of them. The book is intended specifically to appeal to those who have heretofore taken but little interest in the arts, and have had no realization of the fact that the fine arts are for them and that these arts are already inseparably connected with their everyday lives.

Each of the chapters has been prepared by a recognized authority on the subject. Written for the laity, the work is free from technical matter and is notable for the clarity of its language and absence of complicated theoretical discussion. It presents in simple form the vital principles of design and construction which not only govern good architecture, but should also influence the character of all other arts and every manufactured product and material thing that human hands can make.

483 pp., 5¾ x 8½ ins. Fully illustrated, bound in cloth

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THE ARCHITECTURE OF THE RENAISSANCE IN ITALY.
By William J. Anderson; Revised and Enlarged by Arthur
Stratton. 316 pp., 6 x 9 ins. Price \$7.50. Charles Scribner's Sons.

ONLY by study of the general history and the social conditions of the period is the architecture of the Renaissance in Italy comprehensible. It was a period which saw the papacy reach the very culminating point of its wordly power and aggrandizement, and one after another the occupants of the chair of St. Peter constructed and embellished in ways likely to render their names famous, while the rise to eminence and power of certain merchant princes placed them in positions to build upon a vast scale and at fabulous cost. The entire epoch was for art of every kind a sort of dazzling, brilliant noonday; nothing to compare with it had been known before, and as far as can be seen nothing which might even remotely approach its splendor is likely to follow.

Of quite a number of excellent works on the important topic of the Italian phase of the Renaissance that published originally in 1896 by William J. Anderson is among the best in which the subject is covered within reasonable compass. The original edition has for some time been out of print, we are told, and now there has been produced a new edition. Since 1896 there have been many changes in the points of view from which architects consider and historians write; 31 years may see the upsetting of many theories, and this new edition "revised and enlarged by Arthur Stratton," embodies changes which are necessary in view of "the researches of students, which have led them into the study of particular buildings, particular architects and particular periods." The volume is made especially attractive by the inclusion of 90 plates and some 150 text illustrations, and a helpful bibliography is divided into sections, each dealing with some particular era of the Renaissance.

CATHOLIC ECCLESIOLOGY. *By Edward Joseph Weber, Architect.* 199 pp., 9 x 12 ins. Published by the Author at 400 N. Craig Street, Pittsburgh.

THOSE who follow the progress of architecture have drawn attention many times of late to the improvement made in the matter of design in structures of many types. In no department of architecture has this advance been more marked than in what pertains to ecclesiastical buildings and to the furnishings and accessories which form so important a part in determining their excellence or their lack of merit. It is quite true, of course, that the "commercial" architect is still abroad in the land; his devastating work goes on, but with ever-lessening momentum and increased opposition as clients and building committees become more discriminating and better informed; and the makers of church accessories, while they still perpetrate occasional atrocities, are considerably less of a menace to good architecture than they were a few years ago. Particularly reassuring has been the advance made lately in the designing and planning of Catholic churches and institutional buildings, partly because Catholic churches, when once established, are not subject to frequent removal as neighborhoods change and decay, and partly, too, because Catholic churches, besides being more permanent, are as a rule built upon a scale somewhat larger than those of other religious bodies. Bishops and priests, moreover, are now not so likely as once they were to select and retain an architect for an important work merely because he professes their creed; their



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Mr. Major's excellent work is the result of a careful study of the style as it was interpreted in the North and East, and particularly in the South. The illustrations of exteriors and interiors are full of suggestions for anyone seeking a variety of architecture bold, simple and effective, which supplies a fitting background for life in America. The book is richly illustrated, and shows existing work, large as well as small, in both city and country.

236 Pages; 7½ x 10¾ inches. Price \$15

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aim is rather to secure the best architecture they can obtain, and the results are encouraging, particularly in the Diocese of Boston, where there are churches not a few of which do credit to the priests who rendered them possible no less than to the architects who designed them.

This volume deals with a number of churches and particularly with the cathedral of the Diocese of Wheeling, W. Va., designed by Mr. Weber. The churches, many of which are of no great size and of truly moderate cost, notably the church of St. Margaret Mary at Parkersburg, W. Va., are charming by reason of their restraint and simplicity, a simplicity which possesses nothing of the bleakness or bareness which many might feel must attend or be a part of simplicity. The illustrations of the cathedral at Wheeling show a church noble indeed, excellent as to taste and adorned with discrimination and skill, although one might regret in a church so important the placing of the organ and singers in a western gallery instead of in a properly appointed liturgical choir. The author, in extremely well written text, deals with every detail of the equipment of Catholic churches,—fonts, confessionals, the altar, sanctuary, sacristy, etc., without any of the absurd mistakes which only too often mar writings on this subject and sometimes change their meaning. The volume is an excellent record of progress.

MUDEJAR. By Georgiana Goddard King. 262 pp., 4 x 6½ ins. Price \$2.50. Longmans, Green & Co., New York.

THERE is probably no country in the world whose history has influenced more directly its architecture than Spain, and in that country's long and magnificently varied history there has been no era which more definitely influenced architecture than the period during which the Moors lived under Christian rule, the term *Mudejar* being used to define the era and what pertains to it.

The traveler with an eye to architectural values finds in many parts of Spain a type of ornament which differs widely from anything to be found elsewhere in the world,—a type which while possessing certain characteristics of the Gothic is strongly reminiscent of the East, marvelously effective while being essentially simple, and appearing not only in architecture but in Spanish metalwork, wood carving, fabrics, and more than in anything else in tiles and other forms of pottery. All-over or diaper patterns appear to be intricate almost beyond belief until study or analysis shows them to consist chiefly of interlaced geometrical forms. Spandrels and the surrounds of windows and doors made much use of *Mudejar* ornament, its richness giving a sort of super-dramatic emphasis by reason of the Spanish habit of using the highly ornate in contrast with the austere.

This work is No. VIII of the "Bryn Mawr Notes and Monograms," and its author is Professor of History of Art at that college. The work, while necessarily largely historical, deals with *Mudejar* architecture and art of other kinds in a manner likely to hold the interest of the reader even if he be neither historically nor architecturally inclined, while to the student of ornament the work is valuable because of its elucidation of certain obscure passages in the history of the development of design. At the end of the volume a glossary defines certain terms which are used in the text, and some ten pages contain notes which are more appropriately placed there than as footnotes on the text pages.

THE EDITOR'S FORUM

LE BRUN SCHOLARSHIP COMPETITION

THE Executive Committee of the New York Chapter of the American Institute of Architects, as Trustees of the Traveling Scholarship founded by Pierre L. Le Brun, announces a competition for the selection of a beneficiary. The program which was issued about January 15, 1928, called for drawings to be delivered about March 15, 1928. Those wishing to enter the competition should arrange at once for nomination by members of the American Institute of Architects. Nomination blanks can be had of the secretary of any chapter or of the Le Brun Scholarship Committee, Room 530, 101 Park Avenue, New York.

A. W. BROWN TRAVELING SCHOLARSHIP

ANNOUNCEMENT is made of a competition for the selection of a beneficiary for the A. W. Brown Traveling Scholarship, this competition to be held under the direction of a committee of the American Institute of Architects. Programs will be mailed to approved applicants about March 19, drawings to be delivered on May 7, 1928. This scholarship is the gift of the Ludowici-Celadon Company, and is a memorial to the late A. W. Brown, for many years president of that company and a leader in the manufacture of roofing tile. The value of the scholarship is \$2,000, to be used toward defraying the expenses of a year of travel and study in Europe by a worthy and deserving architect or architectural draftsman. Expenses for travel between the winner's place of residence and New York will be paid in addition to this amount. An award of \$250 will be made to the competitor whose design is placed second.

Under the terms of the gift the selection of the beneficiary of this scholarship is to be made by means of a competition to be held under the direction of a committee of the American Institute of Architects, the drawings to be judged by a jury of from three to five practicing architects chosen by that committee. The general requirements of the problem given for the competition shall be similar to those of the Class A problems issued by the Beaux Arts Institute of Design, but the jury shall give due consideration to the personal qualifications of the competitors as well as to the excellence of the designs submitted in the competition. It is further stipulated by the donors that the competition shall be open to any architect or architectural draftsman who is a citizen and resident of the United States, who has never been the beneficiary of any other European scholarship, who has passed his 22nd but not passed his 32nd birthday, and who has been in active practice or employed in the office of a practicing architect for at least six years, or who, if a

graduate of an architectural school, has had at least two years since graduation. Those wishing to compete should write for application blanks to the secretary of the committee, William Dewey Foster, 10 East 47th Street, New York. Other members of the committee are Charles Butler and J. Monroe Hewlett.

COMPETITION FOR TWO-FAMILY RESIDENCES

THIS competition is conducted by The Portland Cement Association and is under the direction of the T-Square Club of Philadelphia, Professional Adviser. The Association agrees to pay to the winners immediately after the judgment of the jury:

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(Four Honorable Mentions)	

The jury of award is composed of Wilson Eyre, H. Louis Duhring, and Robert R. McGoodwin, all of the T-Square Club. This competition closes at 12 o'clock noon, March 1, 1928. Further data may be had from The Portland Cement Association.

COMPETITION FOR WAYSIDE REFRESHMENT STANDS

THE complete purpose of this campaign, with its series of four competitions, each having its own objective, is to improve the appearance of the wayside refreshment stands, which, through ugliness of conception and carelessness of construction, are menacing the beauty of our highways.

The first competition offered prizes for photographs and plans of the best stands already in use. This competition was concluded December 15, the first prize of which was won by Norma Bamman of Plainfield, N. J. The judges were A. F. Brinkerhoff, Harvey Wiley Corbett, George B. Ford, Ely Jacques Kahn and Electus D. Litchfield. The second competition, now being announced, is architectural in character and offers prizes for the best original designs for stands which will improve the present conditions. Ten awards will be made—five for stands without gas pumps, and five for stands with gas. A building in the first case should not occupy a plot of ground of over 3000 square feet, and in the second case, not over 5000 square feet. Prizes totaling \$1,500 are offered in each case. This competition closes March 15, 1928, and further details of the program may be had from the Secretary, Wayside Refreshment Stand Competitions, The Art Center, 65-67 East 56th Street, New York.



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WALL STREET ON SUNDAY

FROM A LITHO PENCIL DRAWING BY
ARNOLD RONNEBECK

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER TWO

FEBRUARY 1928



MODERN ARCHITECTURAL DECORATION

BY

PARKER MORSE HOOPER

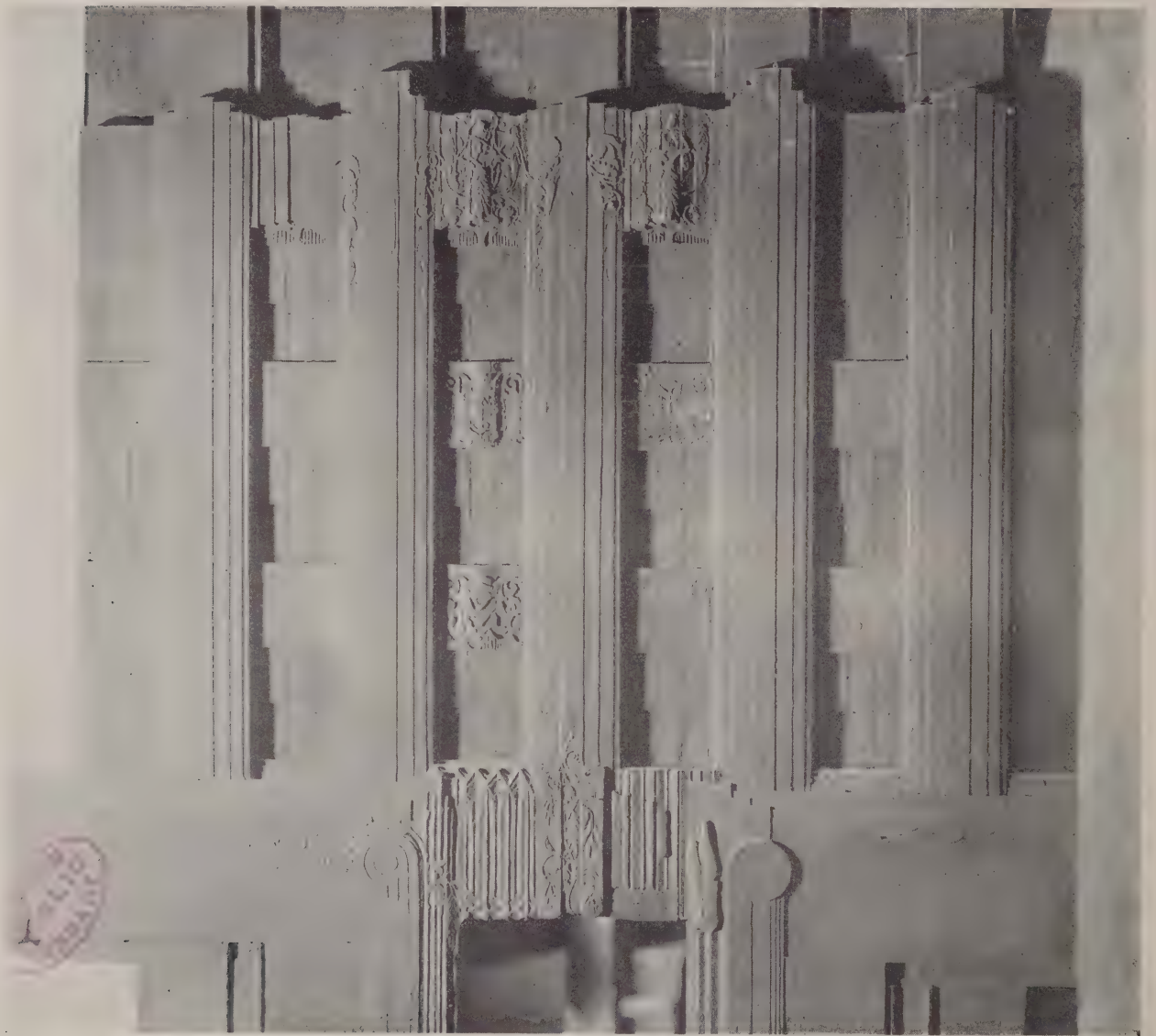
CONVENTIONALIZATION, geometrical and floriated designs, compositions in pure line, mass and color that have no representative significance, are all found in the wide range of modern architectural ornament and decoration. Nearly always the decorative element is stronger than in the ornament of any of the historic periods. That is to say, the composition, in mass, tone, line or color, for the sake of its own effectiveness or beauty, is the main thing. What, if anything, it may suggest or represent is a relatively unimportant matter. Frequently one cannot tell whether a piece of ornamental detail was inspired by a flower, a figure from animal life, or is purely a composition in line, tone or color. This is the pronounced and most salient characteristic of modernist detail.

The sources of inspiration, where such exist, are often found in the art of little known civilizations long since dead, or in the art of distant peoples. This choice is dictated partly, no doubt, by a desire to get away from the familiar forms of classic and mediæval design and their western European derivatives, but it is also due to a recognition of certain inherent qualities of these ornamental styles. Thus we often find in modern detail a strong resemblance to the carvings in low relief that adorn the walls of ancient Assyrian tombs and Egyptian temples, or to the stone sculptures of the Maya culture of Central America. Then, too, some of this ornament is akin to the carving on the canoe paddles of the South Sea Islanders, or to the crude symbolic representations which are familiar features of the totem poles of the Indians of Alaska. All of these various types of ornament have certain marked characteristics in common,—namely, breadth and simplicity of treatment, and above all a strongly decorative character. When considered purely as arrangements of lines, tones or colors, without thought as to what they may represent or of any symbolic significance or other interest that may attach to them, they are highly effective. They serve splendidly to enrich the surfaces upon which they are wrought, which after all is the chief purpose of any architectural decoration and ornamentation, and often their only purpose, though sometimes they tell a story or suggest the character of

some natural form as well, giving added enrichment.

As a matter of fact, it is more the method of composing ornament and the manner of carving, modeling or painting it broadly and decoratively that modern designers have taken from the art of the Assyrians, the Egyptians, the South Sea Islanders, the Mayas, the Alaskan Indians and various other sources, than any ornamental forms. They have taken the essential characteristics of their technique rather than the designs themselves. In the Egyptian and in the archaic Greek carvings in stone our sculptors are finding the masterly handling of the material that serves as a guide in their own work,—methods of producing crispness, boldness, softness, or whatever effect they wish to convey in their decorations. Much of the detail in the modern style is purely decorative in the sense just defined. It consists often of carving done only for the purpose of producing a play of light and shade in areas of a certain desired form at points on the building where this relief or accent seems to be needed. Sometimes color is used in the same way. The ornamental detail of most buildings in the modern style is a more intimate part of the structure than is the ornamentation of most of the buildings of earlier times, with the possible exception of the work in Assyria and Egypt already referred to. Usually the ornament could be stripped from a Gothic or Renaissance building, for instance, without destroying the composition of the whole; it might be removed as one might rip off a band of embroidery from a Renaissance vestment without destroying the garment. But in the best of the thoroughly modern designs the detail is an integral part of the composition.

Modern decoration is often in low relief, sometimes painted or executed in colored tile and terra cotta, rather than in high relief carving or in the round. This is no doubt due to the recognition of the wall surface as the main thing, a plane that is not to be denied, but to be worked in, not upon. Modern ornamentation is not an incrustation, usually, as much of the detail of past centuries is. This is in consonance with the idea of simplicity that is strong in modern design. It is also in agreement with one of the essential characteristics of modern steel-frame



Models in Clay for the Decorative Treatment of the Lower Stories and Main Entrance of the New Jersey Bell Telephone Building, Newark

Voorhees, Gmelin & Walker, Architects



Editor's Note: These Models in Clay of Decorative Details for the New Jersey Bell Telephone Building, Newark, are all Splendid Examples of the New Use of Geometrical and Floriated Designs in Consistent Rhythmic Combination. In Place these Decorations Seem to Grow Out of the Structure of the Building of Which They Are a Part

Voorhees, Gmelin & Walker, Architects



Editor's Note: Although Inspired by no Particular Period of Architectural Decoration, the Motifs of this Richly Carved Panel and Splayed Jamb-head Are Suggestive of Ornamentation Found in Archaic Greek and Early Chinese Designs. Architects Have Struck a New Note in this Example of Conservative Modern Decoration

Dennison & Hirons, Architects

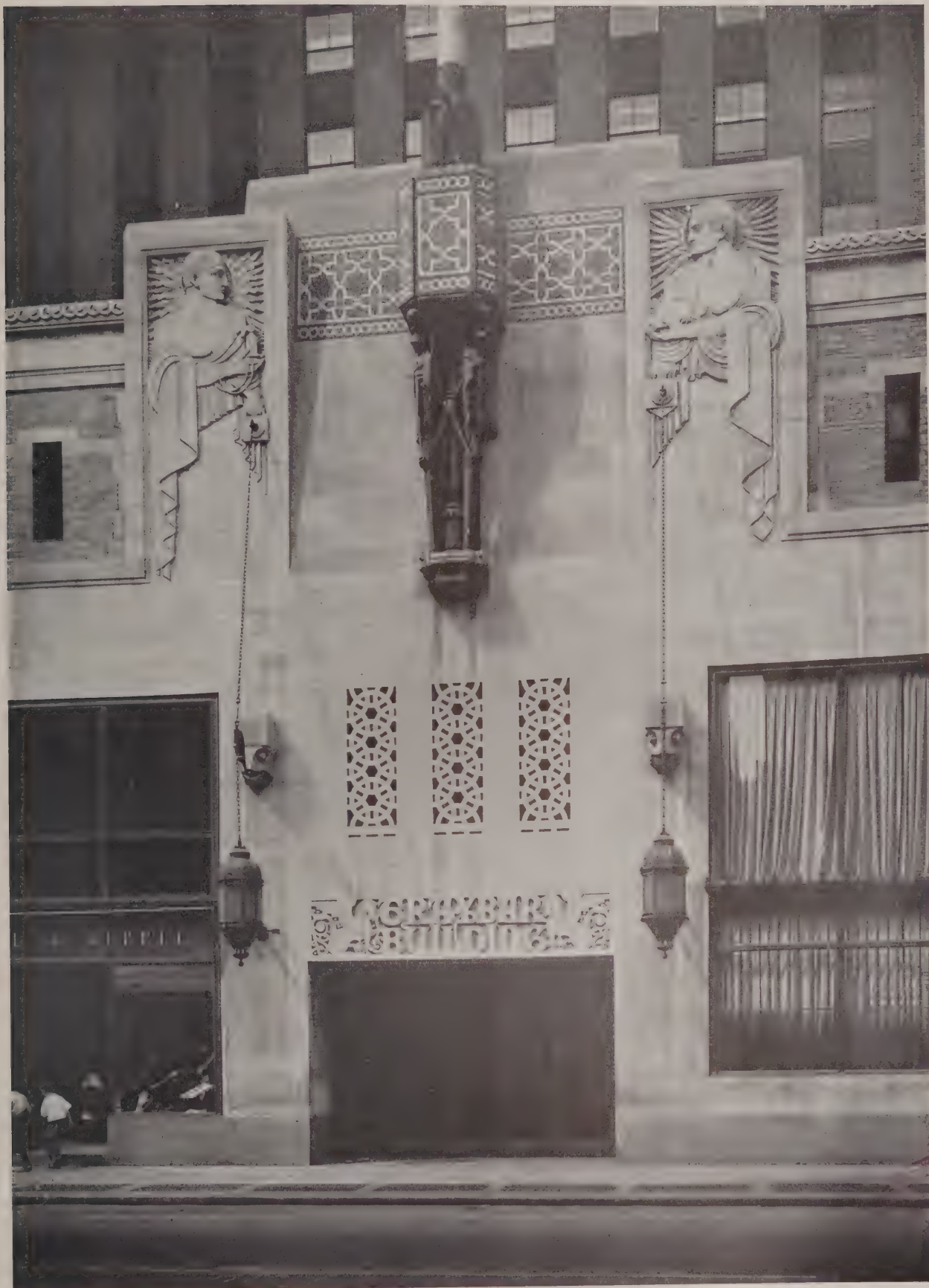


Restraint and Character Are Shown in the Modern Decorative Treatment of the Narrow Entrance Bays of No. 420
 Madison Avenue, New York
 Dennison & Hirons, Architects



The Simplicity of the Decorative Treatment of this Entrance of the Graybar Building, New York, Illustrates a Successful Use of the Modern Style of Architectural Decoration

Sloan & Robertson, Architects



Editor's Note: A Combination of Panels of Colored Faience, and Conventional Symbolical Figures and Decorative Lettering, Deeply Cut into the Stone Wall of the Graybar Building, Exemplify the Conservative Type of Modern Architectural Decoration

Sloan & Robertson, Architects

buildings,—the thin walls, upon which ornament that is flat or in low relief is most suitable. When sculpture in high relief or in the round is employed, the practice is made consistent with the modern idea that all architectural decoration and adornment should be treated as an integral part of the structure, a part of the carving of a great piece of craftsmanship which happens to be a building. This is often done by carving the details on parts of the solid mass of masonry and leaving them as though the work had been stopped before the complete figure had been carved, like partly finished statues emerging from the sculptor's block of marble.

There is a difference in the distribution of the detail on characteristic modernist buildings, for it is localized in spots, usually, instead of being used largely in string and belt courses, in cornices and entablatures, in spandrels and panels as is the common practice in the enrichment of most buildings based on historic precedent. As far as detail other than ornament is concerned, but little is used. The orders and other architectural forms on modernist buildings are not consistent with the new style, and when attempted they are ornamented in accordance with the methods already discussed. The detail of modernist buildings is essentially decorative rather than architectural in the sense of being derived from

construction forms applied as decoration. Color is becoming more and more a prominent part of modern architecture and is being used constantly, as are the other elements, as a part of the whole scheme of the building. Often, as in the case of a number of buildings by Buchman & Kahn, illustrated in the January issue of *THE ARCHITECTURAL FORUM*, color is an outstanding feature of the design, and is needed in our city buildings as a relief from the monotony of dull-toned materials. The city dweller is deprived of the varied coloring of the country, so the use of color in architecture is the only possible substitute. Also, color has the power of doing many things besides giving pleasure in itself. It can, for instance, through the use of dark colors at the base of our buildings, relieve the sense of confusion in the streets, while the use of light colors on the upper parts of tall buildings can relieve the sense of oppressiveness and overpowering masses of the towering structures all about us.

The use of color is still in an experimental stage, and has great possibilities as a legitimate and consistent means of decorating high buildings. But first comes the study of the main problem, the designing of masses expressive of present-day conditions and requirements, upon which is based sound and legitimate development of modern architectural design.



An Unusually Interesting Treatment Gives 'Variety' and Decoration to the Lower Stories of the Graybar Building, New York

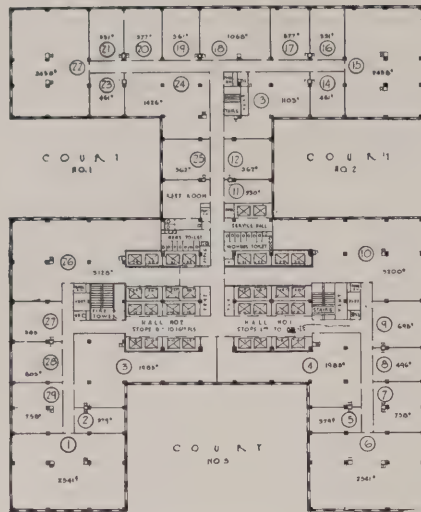
Sloan & Robertson, Architects



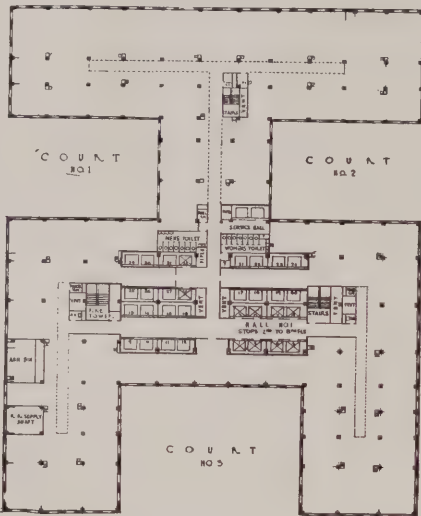
Photo. Wurts Bros.

Plans on Back

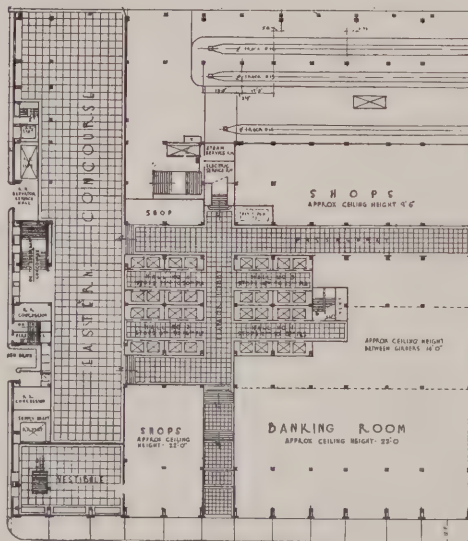
GRAYBAR BUILDING, NEW YORK
SLOAN & ROBERTSON, ARCHITECTS



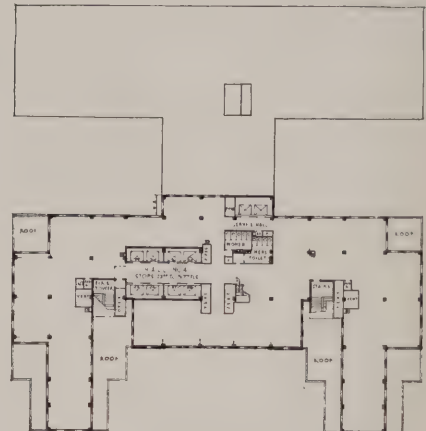
Eighth Floor



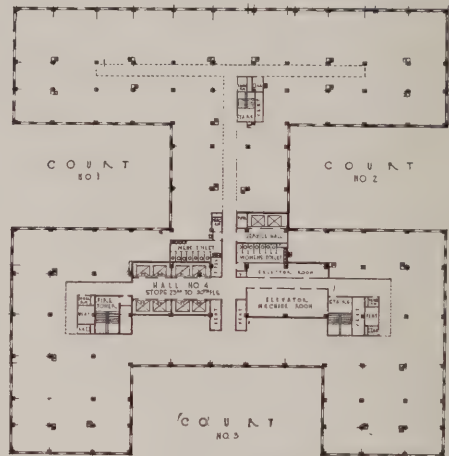
Third Floor



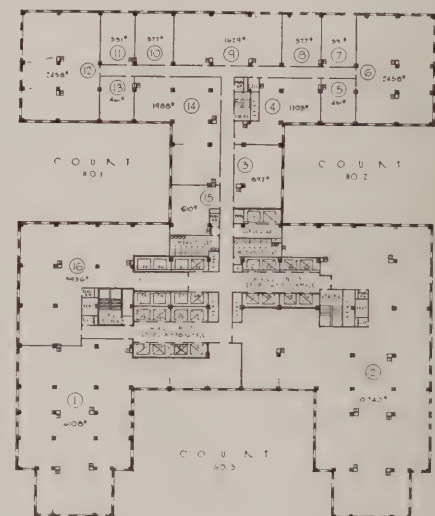
Ground Floor



Thirtieth Floor



Twenty-fifth Floor



Sixteenth Floor

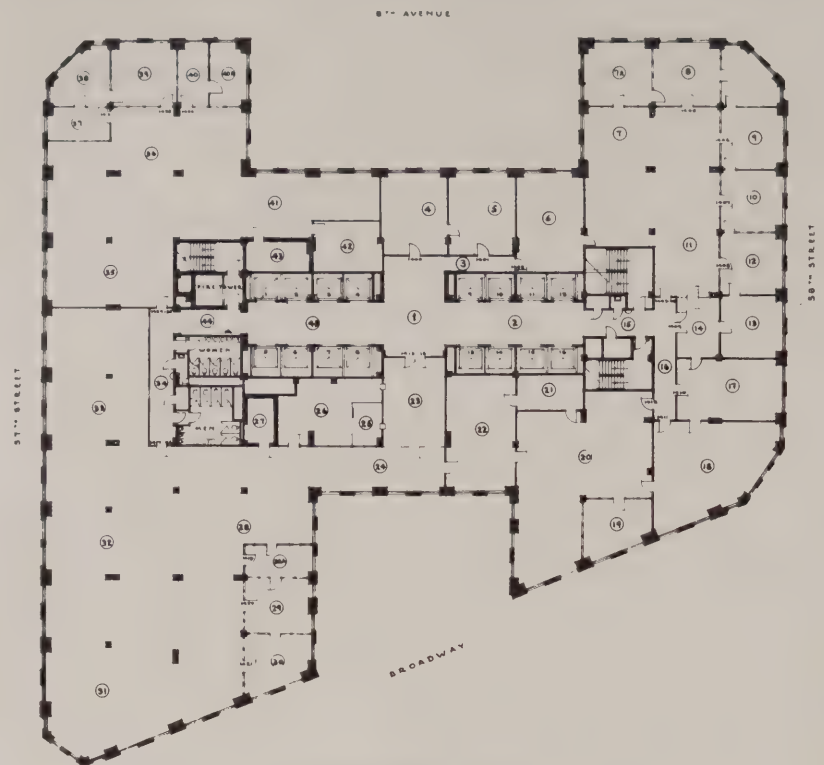
PLANS, GRAYBAR BUILDING
SLOAN & ROBERTSON, ARCHITECTS



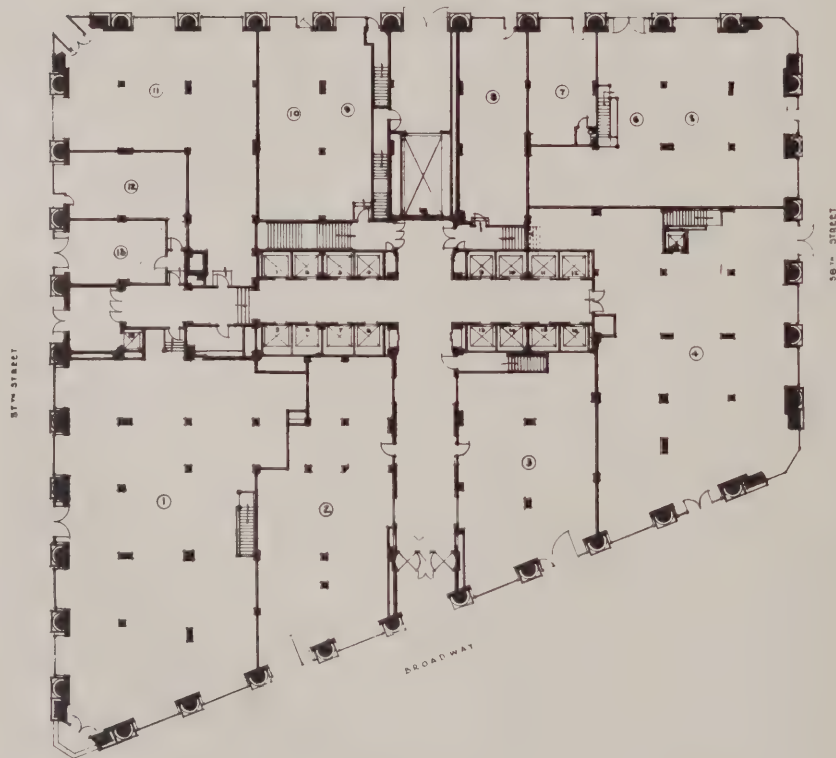
Photos. Sigurd Fischer

Plans on Pages 164 and 166

GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS

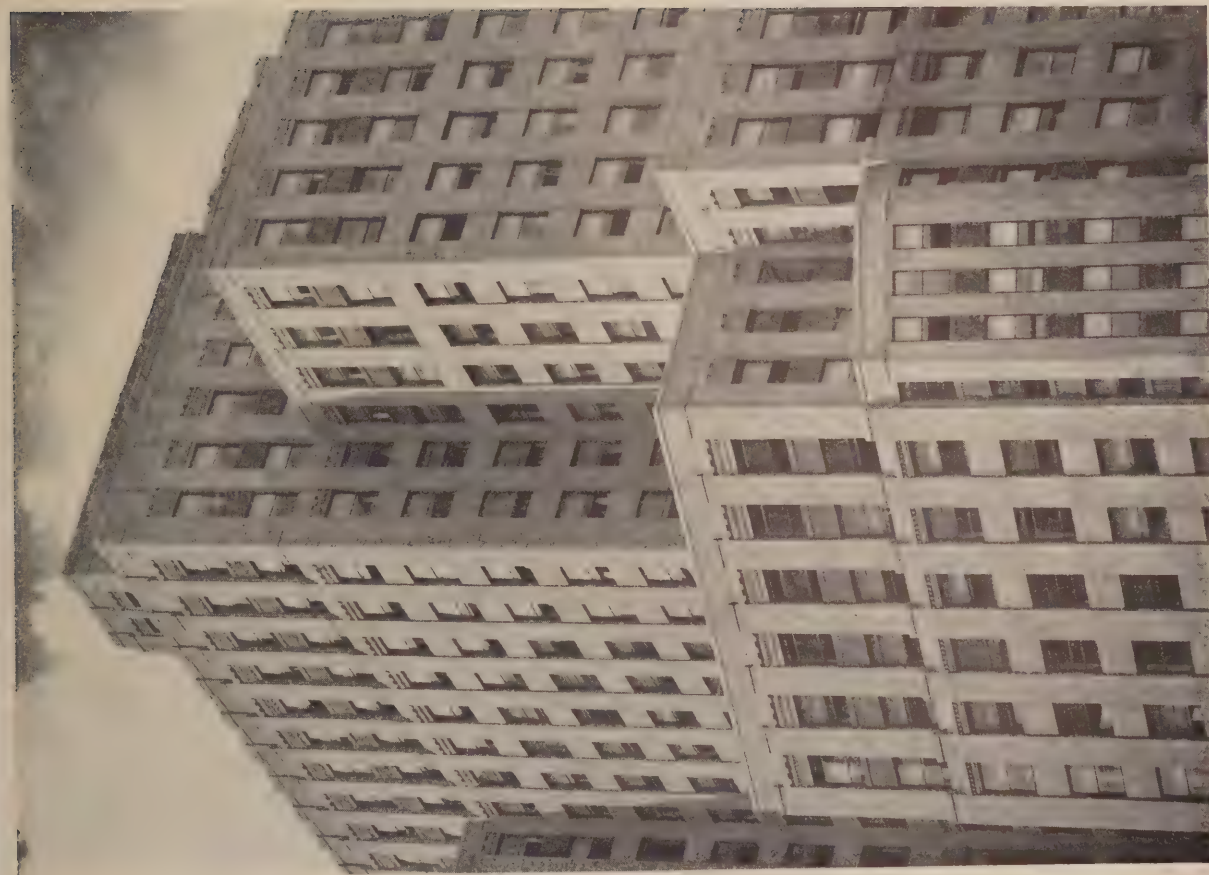
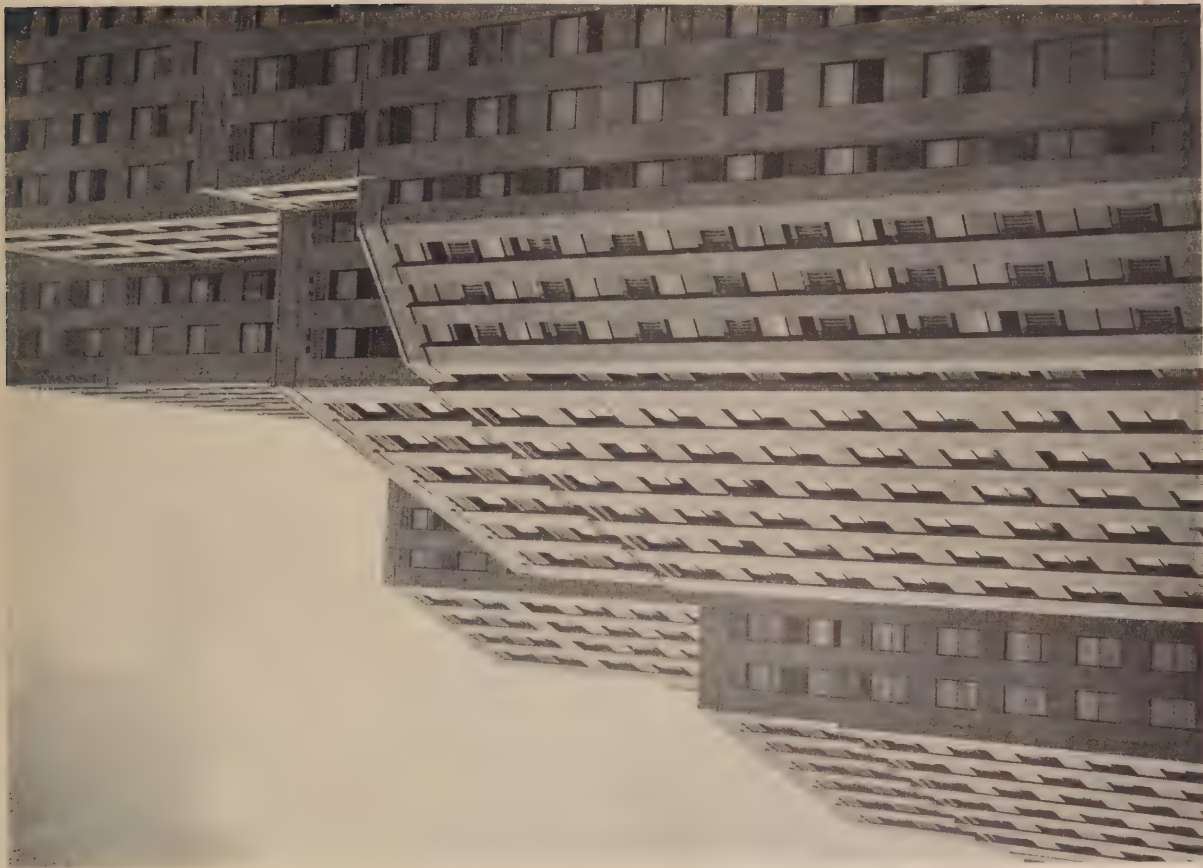


FOURTEENTH FLOOR

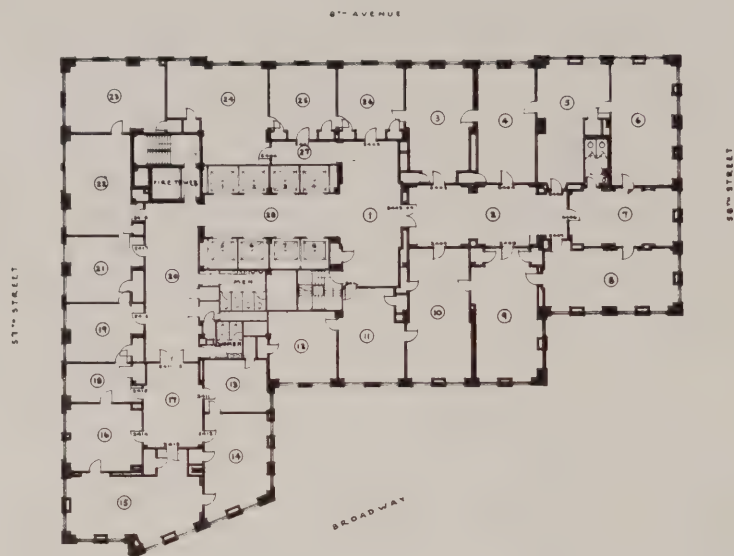


FIRST FLOOR

PLANS, GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



THE INTERESTING ARRANGEMENT OF THE SETBACKS IS DUE TO THE IRREGULARITY OF THE SITE
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



TWENTY-FOURTH FLOOR
 PLANS, GENERAL MOTORS BUILDING, NEW YORK
 SHREVE & LAMB, ARCHITECTS



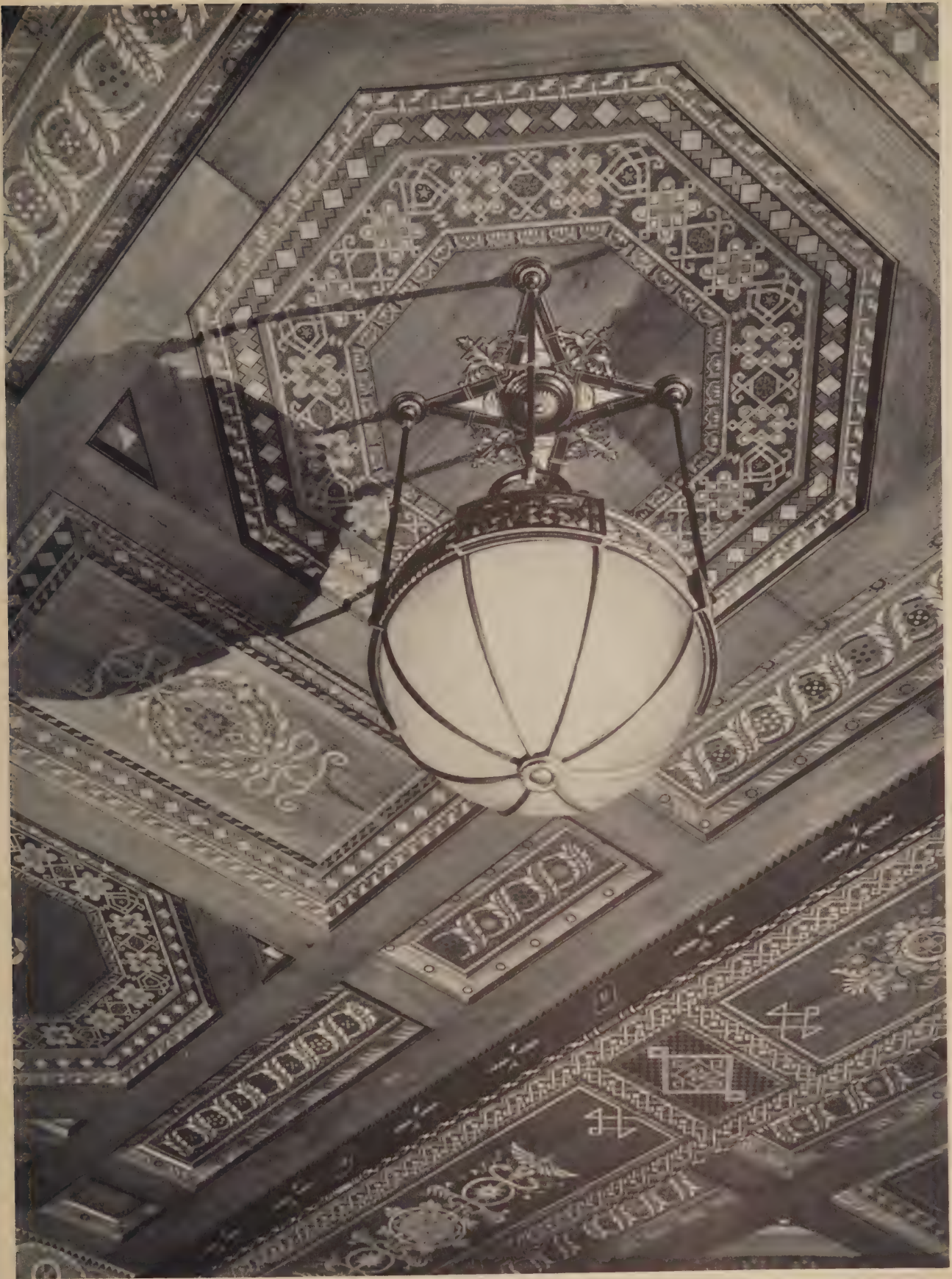
SECRETARY'S ROOM, TWENTY-FOURTH FLOOR
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



MAIN DINING ROOM, TWENTY-SIXTH FLOOR
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



BOARD ROOM, TWENTY-SIXTH FLOOR
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



DETAIL OF BOARD ROOM CEILING
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



DETAIL OF BOARD ROOM
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS



TELEPHONE ROOM, TWENTY-SIXTH FLOOR



PRIVATE DINING ROOM, TWENTY-SIXTH FLOOR
GENERAL MOTORS BUILDING, NEW YORK
SHREVE & LAMB, ARCHITECTS

A GREEK REVIVAL COURT HOUSE IN SOUTHERN INDIANA

BY

REXFORD NEWCOMB

PROFESSOR OF ARCHITECTURE, UNIVERSITY OF ILLINOIS

THE Greek Revival movement in the history of American architecture was an interesting and far-reaching development. While I think it is correct to say that a way was prepared for it by the slightly earlier "Classic Revival," which was a style of Roman rather than Greek inspiration, it has always seemed to me that the Greek Revival brought to an end a worthy movement that arrived in America with our earliest English forefathers and came to flower with excellent examples of the American Georgian, in New England, the middle states, and the south. Indeed, these Colonial-Georgian types found their way over the mountains, and the middle west, parts of Illinois, Ohio, Michigan, and particularly Kentucky, are not without excellent examples of this early American style, which, becoming acclimated along with our forefathers, in time took on an almost indigenous character. But the "Colonial," which began to forge for itself an expressive set of characteristics long before the end of the seventeenth century and which, by virtue of a growing classicism, gradually became an adequate, if belated, American reflection of English Georgianism, was to come to an end, and that almost by accident, about 1800. The movement which terminated this interesting expression of early American life in architectural form was, after all, again only an American reflection of a corresponding movement in Europe, particularly in England and in Germany, where a decided vogue for the Greek was then in progress.

Those who are familiar with American architectural history will remember that Jefferson was ever a champion of the classic, and believed that classic purity lies more nearly in the Roman, and indeed in the Italian Palladian, than in the Georgian forms prevalent in the last decade of the eighteenth century. While in France, as representative of the young republic, he paid considerable attention to the Roman remains in the south of France, particularly



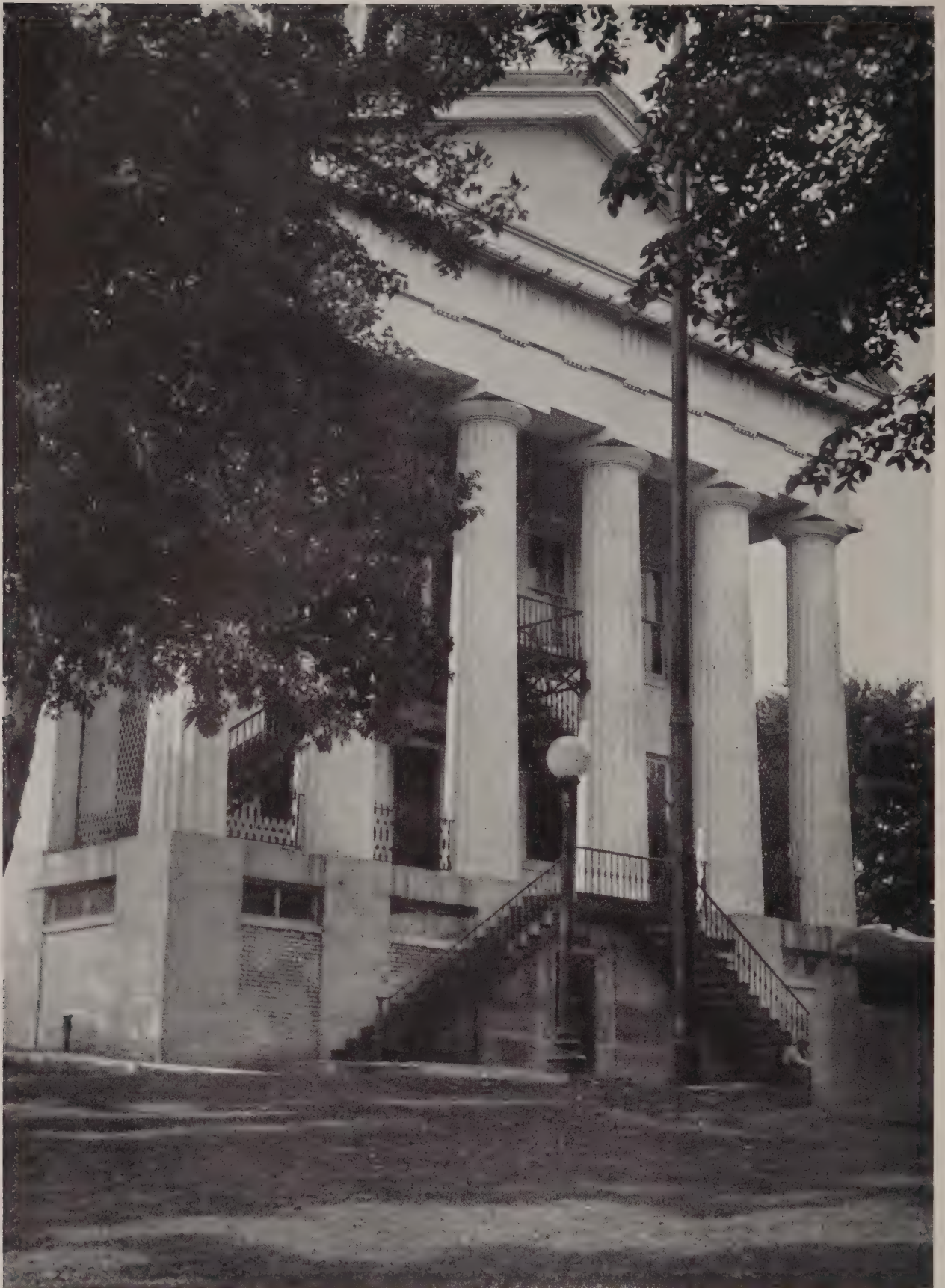
North End, Showing Wide Pilaster Treatment

the Maison Carree, at Nimes, and championed a design based upon this famous Roman structure as worthy for the capitol of Virginia. He believed the new republic on this side of the Atlantic would do well to look to the classical architecture of the old republic in Italy for suggestions in architectural expression. His own residence, Monticello, which showed distinct Palladian leanings, showed also pronounced Roman tendencies, as did, in a rather more intense way, his later University of Virginia group.

The Roman, or "Classical" Revival, as it is generally termed, arrested the momentum of the Georgian and in this way prepared for the Greek Revival that was presently to be introduced by Henry Benjamin Latrobe,

an English architect of distinct abilities, who arrived in America in 1796. Mr. Latrobe, due to the English interest in things Grecian, and through the aid of Stuart and Revett's "Antiquities of Athens," Major's "Pæstum," Chandler's "Ionia," and similar publications, had thoroughly mastered the principles of Athenian architecture, and, so far as I know, was the first American architect to be so equipped. Latrobe's first chance came with the design of the Bank of Pennsylvania, two years after his arrival in America, and this design, which met with almost instant popular acclaim, awoke Americans for the first time to the beauties of Grecian form. This success was followed by other Greek designs by Latrobe and by William Strickland and Robert Mills, both of whom, apparently, embarked upon a Greek Revival program through Latrobe's influence. Strickland entered Latrobe's office at the age of 16, and Mills studied with him while Latrobe was architect of the capitol in Washington. This group of three men, teacher and pupils, were, by their combined influence, to set the vogue for American architecture,—and especially governmental architecture, naturally of great importance, up to 1850.

During the period from 1825 to 1850 many gov-



THE IRON GRILLES, RAILINGS AND STAIRS ARE INTERESTING FEATURES OF THE SOUTH PORTICO OF THE OLD COURT HOUSE AT PAOLI, IND.



THE GRADUAL SLOPE OF THE PUBLIC SQUARE AT PAOLI, IND., NECESSITATES A HIGH PODIUM AT THE SOUTH END OF THE OLD COURT HOUSE WHICH ADDS MUCH TO THE DIGNITY OF THIS ELEVATION



ernment structures in the way of custom houses, post offices, sub-treasuries and mints, to say nothing of the federal buildings in Washington, followed very closely the Greek temple type. The "official" style of the government keyed the popular taste, with the result that banks, county court houses, churches, residences, and many other types were built in this style. Naturally, the movement filtered westward and into the territory west of the Appalachian mountains, where from 1835 to 1850 many county court houses sought expression in the only vernacular then thought dignified enough for such buildings,—the "Greek manner." This accounts for the existence of the interesting old court house at Paoli, Indiana, some views of which are included here.

The history of the court house of Orange County, Indiana, of which Paoli is the county seat, is characteristic of many another in this section. The story is so typical that I risk giving it in full rather than confining myself to a discussion of the present Greek Revival structure. The first court house was a log building, erected in 1816 at a cost of \$25 and used only till such time as a larger and more substantial structure could be erected. Two sessions of court were held pending the completion of a second building, which was finished in November, 1818. In January of 1817 preparations were made to build a "permanent" court house and, as a fund raised by the sale of town lots proved ample, the county board decided to erect a "creditable building." The contract was let to Jonathan Lindley, February 1, 1817, for the erection of a two-storied stone building, 33 x 50, and 14 feet between floors. The court room was to be below, the clerk's office and jury room above. The structure, which was contracted for at \$4,000, actually cost \$3,950. This is the only court house I ever heard of that cost less than the contract price! The building, which stood at the center of the "public square," is described by a document of the day as being "rather compactly than ornamentally built."

This "seat of justice" apparently satisfactorily fulfilled the needs of this isolated community until 1839, when the county board, after some consideration, prepared specifications for a new court house. The November session of the board annulled the former

action, and nothing was done until the autumn of 1847, when the board determined "to erect a new and larger court house on the public square." Specifications were prepared, and a court house committee was appointed. These gentlemen gave a contract to Andrew L. Burke to make the brick, paying \$7.50 per 1000 for the ordinary variety and \$10 per 1000 for those for the columns. Michael Ombaker was engaged to lay "stone foundations at \$1.25 per perch"

and to erect brickwork, while William Harman was employed to erect the woodwork. All this labor seems to have been contracted for individually, no such thing as a "general contract" being drawn. Work on the structure was continued until 1850, when it was turned over to the county, fully finished, at a cost of \$14,000. The building was considered in its day the handsomest and best built court house in southern Indiana, and was thus described by a contemporary: "The order of architecture, especially the four huge columns of the south end, is nearer the Doric than any other. The shaft of the circular column is of the best brick covered with cement of great durability, while the capital is of plain hydraulic limestone." This limestone, I pause to add, is the far-famed Indiana limestone, quarried most extensively in the country just northward. "On each side and each end of the building," the description continues, "are engaged columns (more properly pilasters) of brickwork relieved by engaged capitals to correspond with the circular columns on the south portico." The distinct slope of the public square necessitates a high podium at the south end of the structure, although at the north end the main floor is only three steps above grade. The building, 53 x 74, is simple in plan. The main floor is bisected longitudinally by a corridor 10 feet wide, with the county officials' rooms either side. The second floor, approached by an iron stairway from the south portico, is devoted to the court room and its appendages. At the center of the ridge is a cupola bearing a clock and weather-vane, a gift of the citizens of Paoli, put up in 1856. If one will examine the accompanying illustrations, I think it will be agreed that, in spite of crudities of detail, the general mass of the structure possesses a distinction surprising for the time, place and method of construction.



Details of the Doric Caps and Columns



STREET FACADE

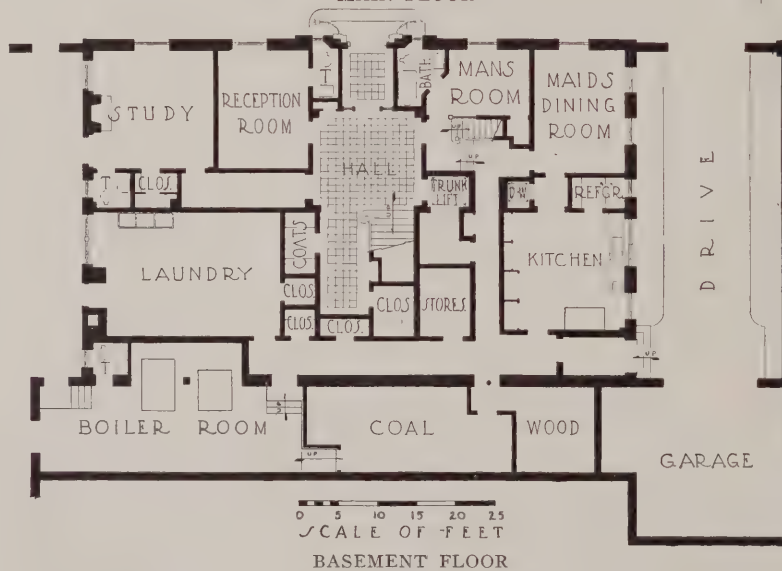
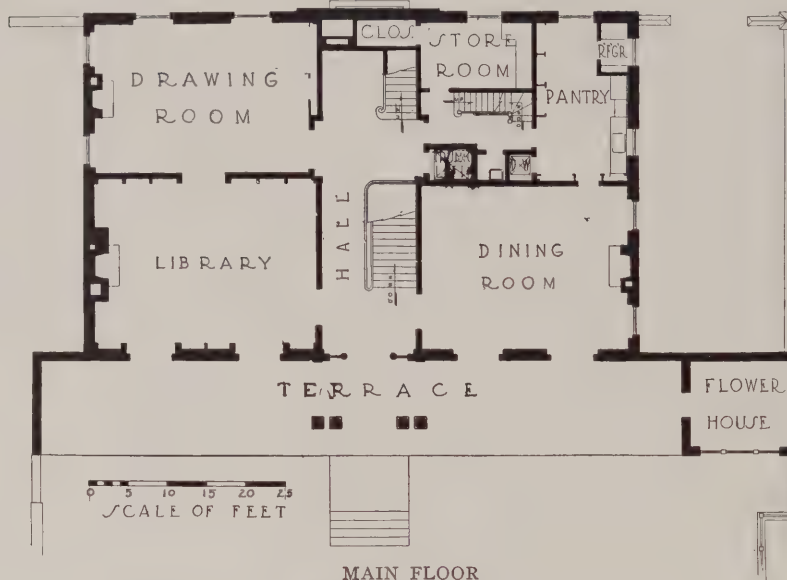
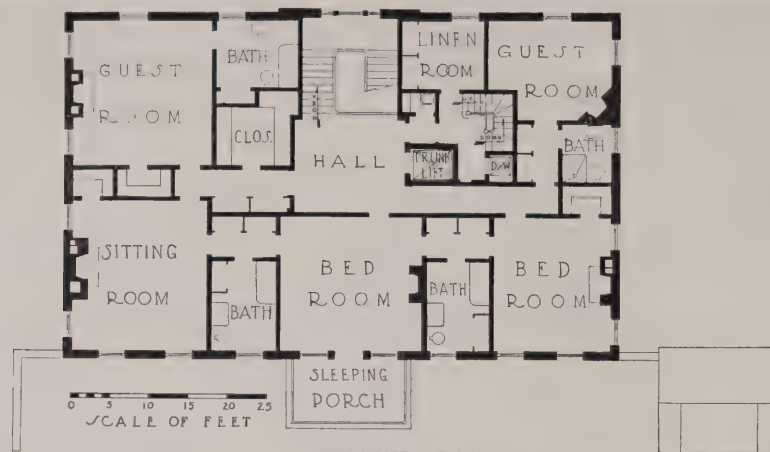


GARDEN FACADE

Plans on Back

Photos. H. D. Eberlein

HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



Detail on Back

MAIN ENTRANCE
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



ELEVATION

SECTION

EXTERIOR DETAILS

SCALE
0 1 2 3 4 Ft.

HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT

FEB.
1928

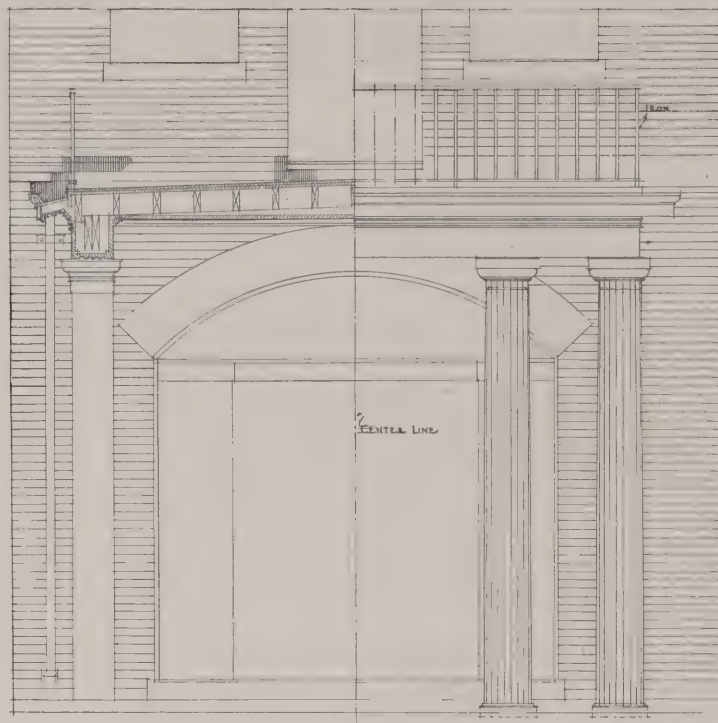
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52

The ARCHITECTURAL FORUM DETAILS



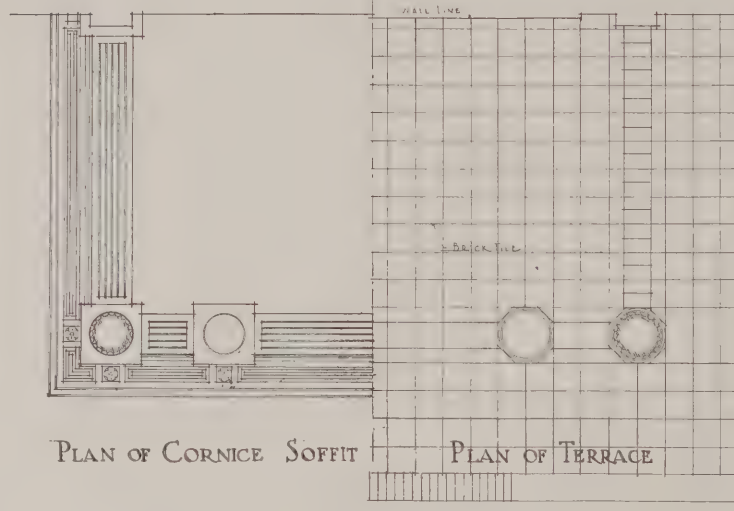
Detail on Back

GARDEN PORCH
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



SECTION

ELEVATION



PLAN OF CORNICE SOFFIT

PLAN OF TERRACE

SLEEPING PORCH

SCALE
0 1 2 3 4 FT

HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON

PLEASANTS PENNINGTON, ARCHITECT

FEB.
1928

No.
53

The ARCHITECTURAL FORUM DETAILS



ENTRANCE TO MAIN FLOOR FROM GARDEN TERRACE
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



DETAIL, HALL ON MAIN FLOOR
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



LIBRARY

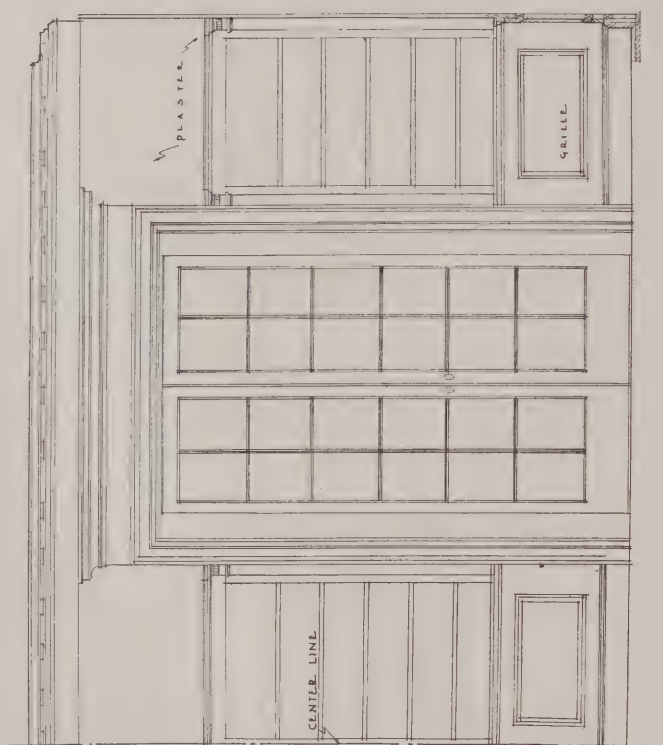
Details on Page 192



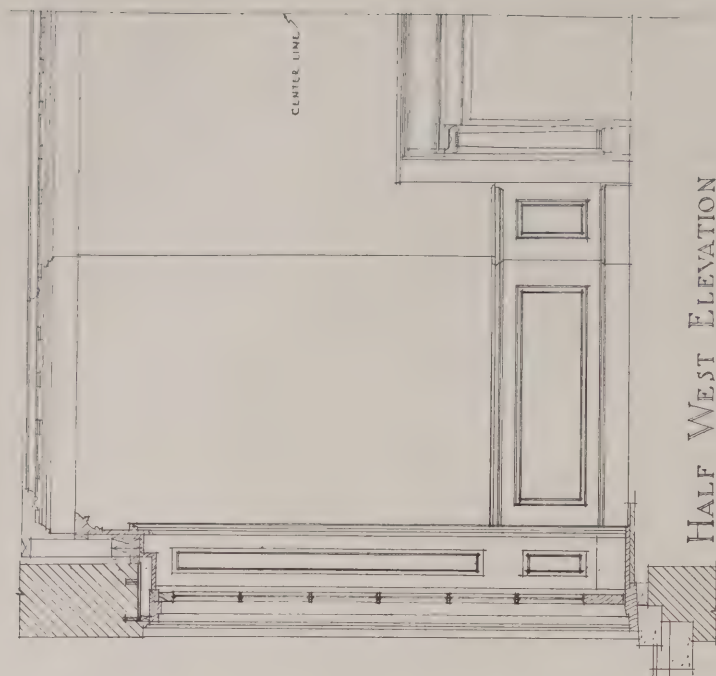
DRAWING ROOM

Details on Page 194

HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT



HALF SOUTH ELEVATION



HALF WEST ELEVATION

LIBRARY



HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT

FEB.
1928

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54

The ARCHITECTURAL FORUM DETAILS



1928
FEB
19

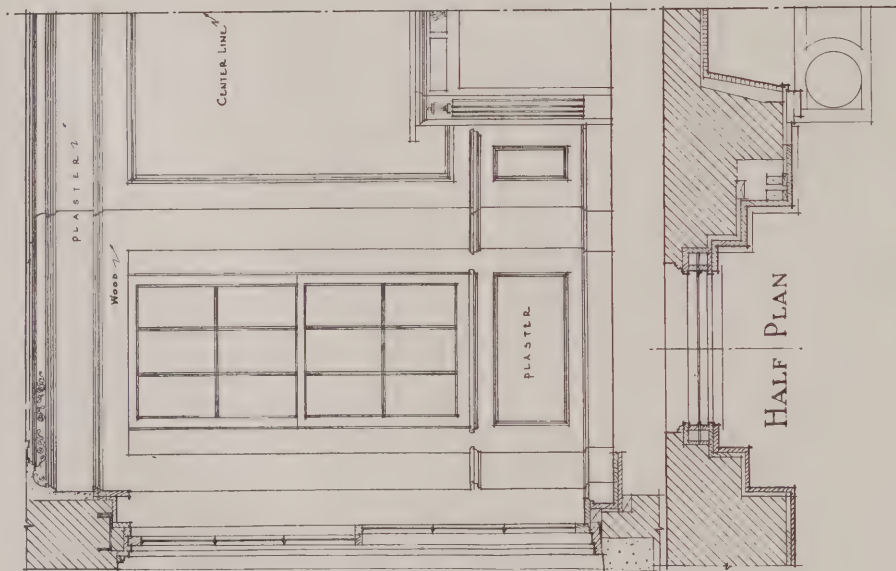
Details on Back

ANTIQUE MARBLE MANTEL IN DRAWING ROOM
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT

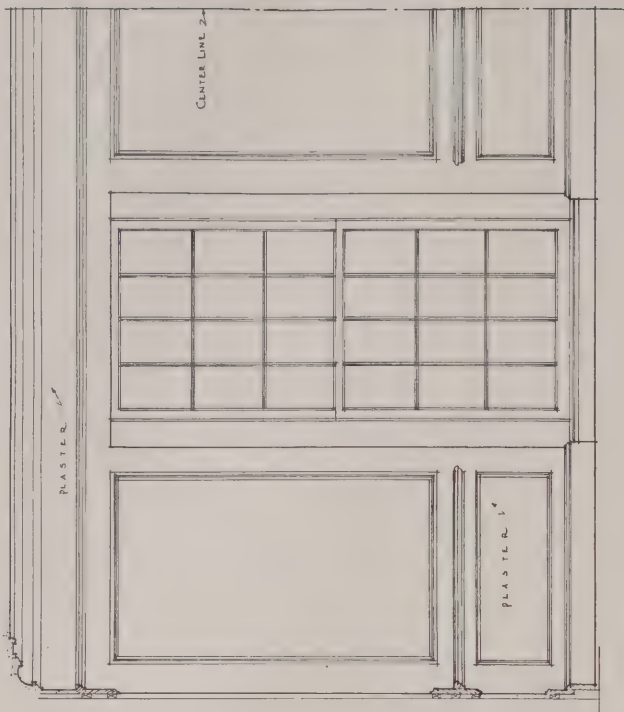
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1928

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55

The ARCHITECTURAL FORUM DETAILS



HALF WEST ELEVATION



HALF NORTH ELEVATION

DRAWING ROOM



DETAILS, DRAWING ROOM
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT

*Details on Page 192*

OLD BLACK AND GOLD MARBLE MANTEL IN LIBRARY
HOUSE OF ADOLPH C. MILLER, ESQ., WASHINGTON
PLEASANTS PENNINGTON, ARCHITECT

THE ELKS' MEMORIAL, CHICAGO

BY

EGERTON SWARTWOUT, ARCHITECT

ERECTED in the year nineteen hundred twenty-four by the Benevolent and Protective Order of Elks of the United States of America in honor of its members who served in the World War." Thus the inscription on the frieze. I reproduce it because it tells in a few well chosen words just what this building is and why it is, and because it answers questions I am asked repeatedly. The casual, but apparently interested, observer asks if this is an Elks' Temple or an Elks' Club, and whether it was built by Chicago and, if not, why in Chicago. And I answer wearily that, as far as I know, there is no such thing as an Elks' Temple, and that I believe the correct name is not club, but lodge; and anyway this building isn't a lodge, it's a memorial; and that Chicago had no more to do with it than Seattle or Concord, Mass.; that it is a national memorial, and that it had to be built somewhere, and they happened to put it in Chicago; more or less in the center of the country, I suppose, but that it might just as well have been in Washington; and that I myself, for certain selfish reasons, would have preferred New York.

And, now that everybody knows when and why and where it's built, it only remains for me to say that it is on the corner of Lake Shore Drive and Diversey Parkway, at the north end of Lincoln Park, in what was, a few years ago, a good residential district. But now the apartment hotel menace is com-

ing up that way, and I suppose it will soon be hemmed in with Bellevues and Elkviews, all with staring rows of windows and blinking electric signs. However, it does face directly on Lincoln Park and has a fine view of the lake, and the park officials have now been obliging enough to cut several vistas through the trees so that there are some interesting distant views of it. The plot it stands on is of fair size, about 400 x 250,—not as large as it should be, by a long shot, but good sized for a large city.

The inception of the memorial was, I believe, in the committee that handled the hospital relief and war work of the order, but my own first knowledge of it came in the spring of 1922, when I received an invitation to take part in a limited competition under a program written by their professional adviser, the late Col. J. Hollis Wells. It was a good program, and the idea was architecturally interesting, but I hesitated a bit, as I wasn't then a member of the order, and I had a perhaps natural, but as it proved totally erroneous, idea that the winner of the competition would perforce be a good Elk. As a matter of fact, I question whether any of the invited architects were, but I do know that in the award of subsequent contracts to builders, sculptors and artists, there was never a question of such a restriction. The building commission, a rather large one, was one of the most, perhaps the most, far-seeing and enlightened commission with which I have ever had the



The Elks' Memorial, Chicago

Egerton, Swartwout, Architect

pleasure of collaborating; while it didn't throw money away, it demanded the best, and was willing to pay a fair price for it; it realized it was building not a commercial structure but a memorial to its heroes; it played no favorites; it got the best materials, the best builders and the best artists the country afforded,—Blashfield, Savage, Fraser, Weinman, Laura Gardin Fraser,—as fine a lot as were ever associated on one operation.

As to the building itself, the central feature is, of course, the memorial; in the wings are the offices of the *Elks' Magazine* and the grand secretary. In other words, it is not only a memorial but a useful structure, a national headquarters. But this utilitarian side of it is so submerged in the memorial proper that the offices become a mere background as it were. The main feature is the great circular memorial hall, which is truthfully expressed on the exterior. The dome is a real masonry dome, and so is the interior shell, of Gustavino tile, with coffers directly applied to it. The whole building is, I'm glad to say, thoroughly logical in construction; there is no fake about it; it is simple, heavy masonry. People have asked me why I did a circle. I can

only say, as I believe I've said before, why not? And yet perhaps there is a reason,—no ritualistic reason, no precedent of the order, but rather a common sense reason, and that is that I wanted to do something, and I thought the commission wanted to do something, that would come to be regarded as typical of the order. The Masons have for some reason or other, perhaps occult, perhaps casual, I don't know, preëmpted the square, with a colonnade generally on a basement, and stepped dome or roof,—all very fine and very monumental, and following somewhat the impetus given by the unknown architect of King Mausolaus who possibly was a Mason himself. Therefore a square was out of the question; the circle had never been used, that is, exactly as it is here; it makes a good practical shape, easy to dome; and it is distinctive, and in time will become, I hope, associated with the order. The next man who does a memorial for the Odd Fellows or the Moose or some other one will be hard put to it to get a dis-

tinctive shape. It's rather a stimulating thought. A triangle has been tried in the French projects of 1800, but it's not easy; an octagon would be good, but a hex is loathsome; and there might be some African symbol distinctly appropriate to the somewhat mythical Sons and Daughters of I Will Arise.

These are pleasant thoughts, but I must return to the building, or I will exceed the space allotted, and possibly crowd out some of the really beautiful illus-

trations. I was speaking of the central feature being round. It is really quite a large round, about 105 feet in diameter, large enough for the sweep of it to be very impressive, seen in perspective from below. The feature of the exterior is, or rather will be, the great sculptured frieze under the columns; this is about 5 feet high and is now being carved from the models of my good friend, A. A. Weinman, and is now about 15 per cent finished. It is a heroic thing, nearly 165 feet long and beautifully composed and modeled. There are few, if any, sculptors who can equal Weinman in architectural sculpture, and few who could model a richly figured frieze on a round surface and keep all one plane. The theme of the frieze is too complicated



Upper Stair Hall, Elks' Memorial, Chicago
Egerton Swartwout, Architect

to explain here; generally it represents the Horrors of War and the Glories of Peace. A particular feature of the arrangement is the great seated figure on each side of the entrance door,—figures much larger in scale than those of the frieze, and yet in perfect harmony with them. I'm sure this frieze will be, when complete, one of the outstanding pieces of architectural sculpture in this country, or in the world. Weinman is also modeling two bronze heroic groups for the niches in the ends of the wings. These are as yet in the scale model stage, but enough has been done to show that they will have the same feeling of strength and grandeur as his frieze.

In front of the building and on stone pedestals at each side of the steps at the sidewalk are two large bronze reclining elks by Laura Gardin Fraser. Now a standing elk is not a very monumental animal. His head is fine, but the legs are too slender for the heavy body. You would have to stand him in the grass or put a lot of other elks around him to get a

solid effect; but the reclining elk has a very fine silhouette, and Mrs. Fraser has made the most of her opportunity. These elks are now cast and in place and are, I think, the best examples of animal sculpture in the country. Under the colonnade, between the columns, are 24 panels nearly 5 feet square, and for these Gerome Brush has made a series of excellent models which will soon be carved. They are similar in treatment to Weinman's frieze below them, and are well composed and executed.

I haven't said much about the architecture of the exterior. It's much easier to talk about some other fellow's stuff, which is really good, so I'll only say it is most excellently built of blue limestone, or gray as they now call it, and is,—well,—not weak. There is a really interesting feature in the two open courts. These courts are formed by the projecting office wings and the reception rooms at the back, and there is a sort of loggia in front, which is glass-enclosed and forms a corridor connecting the wings with the memorial hall. The walls of these courts are low, and there is a good deal of direct sunlight in them, and they are quite heavily planted with shrubs and ivy and really good-sized trees which can be seen through the loggia and which echo the planting in front and on the upper terrace.

As I have said, the feature of the building is the memorial hall. This is circular, about 67 feet across and nearly 100 feet high, and is entirely of marble up to the column caps, some 50 or 60 feet above the pavement,—and very beautiful marble it is, too. The basic marble, the wall marble, is Eastman cream, some almost clear, some veined with golden brown and with green, and some with a pinkish and some with a bluish cloud. I didn't want to use a staring white, and I didn't want to use the rather drab yellowish buff of the self-toned foreign marbles. I had used Eastman in rather small quantities in the Denver Post Office, and I felt it was just the thing we wanted, but it seemed questionable whether the quarry could supply the 10,000 odd feet that were required. I can say truthfully we scoured the entire world for cream marble, but there wasn't any. In my opinion there is no marble that

compares to Eastman, so finally the commission agreed to its use, and we got the amount we wanted; and it's all thick stock, too; 3-inch ashlar, with foot heads and a lot of heavy work in the cornices and vaults and domes of the encircling corridors and lobbies. The columns of the lower order, under the impost, are varied; four of each for the coupled columns supporting the main wall, and of colors that do not cut out too much from the cream marble

of the wall,—*Breche Violette, Escalette, Pavonazzo, Fleur de Peche, Skyros, Breche Centelli, Fantastico Viola, Madre* veined Alabama and Eastman *Cippolin* and some others. The frieze of this order is *Lumi*, a light red marble with small white veins. It shows in the illustrations much darker than it really is, as also, I regret, do the bronze register faces, which are really bright golden bronze. The wreaths in the frieze are of Eastman stuck to the *Lumi*. The columns of the niches are in pairs, of *Levanto, Verte Maurin, Rouge Rubo* and *Rouge Jaspe*, very rich and deep in color, and over the niche heads the *Lumi* frieze changes to *Rubo* to tie the columns together. There will be four heroic gold bronze statues in these niches. James Fraser



Stair Hall, Elks' Memorial, Chicago
Egerton Swartwout, Architect

has them now nearly finished, and they will be, I'm sure, the very best things he has ever done, and that means much; the best things of James Earl Fraser equal the best anyone can do.

The columns of the main order are about 25 feet high in the shaft and are of heavy, rich colored marble. Here again the marble varies, but only in the color; the tone value is the same. I doubt if the casual visitor would notice they were different unless it were called to his attention. They are really beautiful examples of *Verde Antico, Tinos, Rouge Jaspe, Levanto, Rouge Rubo, Rouge de Ranca, Verte Maurin*, three or four of each, not placed together, of course, but scattered. The dome, as I have said, is plaster on Guastavino tile, richly decorated by Charles Rinschede, and the whole space is lit by reflection from the eye of the dome. I worked out this scheme some years ago for a large dome in Boston, but it was never carried out, and I had quite a time persuading the lighting experts of the Elks'

Memorial that it would work. The reflector is of plaster on wire lath in the shape of a hyperbola of revolution, with the apex rounded, which by the way is not necessary, and which gives the curious effect of a golden ball hanging in space some distance above the aperture of the dome, whereas in reality it is something like 8 feet below the aperture. The plaster of the reflector is covered with gold, silver and copper leaf in a conventional design of rays and clouds, and it receives and reflects the light of 50 or more low-power searchlights, or rather powerful reflectors, concealed in the space between the inner shell and the outer dome. The light is controlled by dimmers, and the effect is really fine; the light does not touch the side walls but is reflected up from the floor; the dome itself is in obscurity, and the effect is exactly as if there were a brilliant sun overhead shining down through a golden skylight. By turning on the light full power, small print can be easily read on the floor, 100 feet below. When the light is off in the daytime, the reflector looks merely like a piece of decoration. It is a good stunt, and as far as I know a new idea.

But the real glory of the memorial hall is its decoration. We persuaded Blashfield to do three large decorations in the lobby leading into the grand reception room, each about 8 x 16. These are now in place, but unfortunately don't show in the illustrations. They are fine, all of them, and the one over the door is, I think, the best thing the dean of mural painters has ever done. He may do even better, for he is yet a young man, but the Elks are indeed fortunate in possessing the best work of the best known and best loved mural painter in America. The large panels, 12 of them, between the windows and back of the marble columns, are now in place and are the work of Eugene Savage. I won't attempt to describe them; it's been done so much better than I could by Royal Cortissoz in *Scribner's* of July last. I'll only say they are wonderful. Savage is now doing the eight kite-shaped panels above the niches,

a proposition really much more difficult in design than the panels above. At the time of writing, in November, 1927, the quarter-size working sketches had been approved, and the panels should be in place in the spring or early summer. Savage has also a number of paintings in the grand reception room, two large wall panels, and a whole lot of ceiling paintings of various sizes. I counted up to 68 one day,—maybe there are more. This room, which is shown in an illustration, is about 75 feet long and 30 wide and high,—about a double cube. The walls are English oak and the ceiling gilded. Savage has as yet only sketches. Here the decorations will be much heavier and deeper than his work in the memorial hall; they have to be, to stay on the same plane as the heavy oak and the rich, deep gold, but I'm sure the effect will be equally fine. In this room are five very excellent windows in stained and leaded glass by Paris & Wiley,—very good in design and subdued in color,—and Charles Kinsman has done some good fixtures.

I haven't space to go into any more details, and really it isn't necessary. I can only express my great appreciation of the collaboration of those who contributed so much to the building,—to ex-Governor Tener, and the Hon. J. T. Fanning and the rest of the commission; to my old friend, the late Col. Wells; to George Smith, our representative at the building; to John Hegeman, the builder, and his associates, Fay Evans and Andrew Leith; to my assistant and my friend, E. A. Bauer, known as "Eddy," without whom I would have been swamped in the details of construction, and who knows as much about building as he did about baseball when he pitched for Pittsburgh,—and to all the artists who have done their bit. There has been a good deal said lately of collaboration by Grant LaFarge and others at conventions and dinners. Some day I hope Grant will learn of this building and talk about it, for here as never before, I believe, is an example of real collaboration.



Side View, Elks' Memorial, Chicago

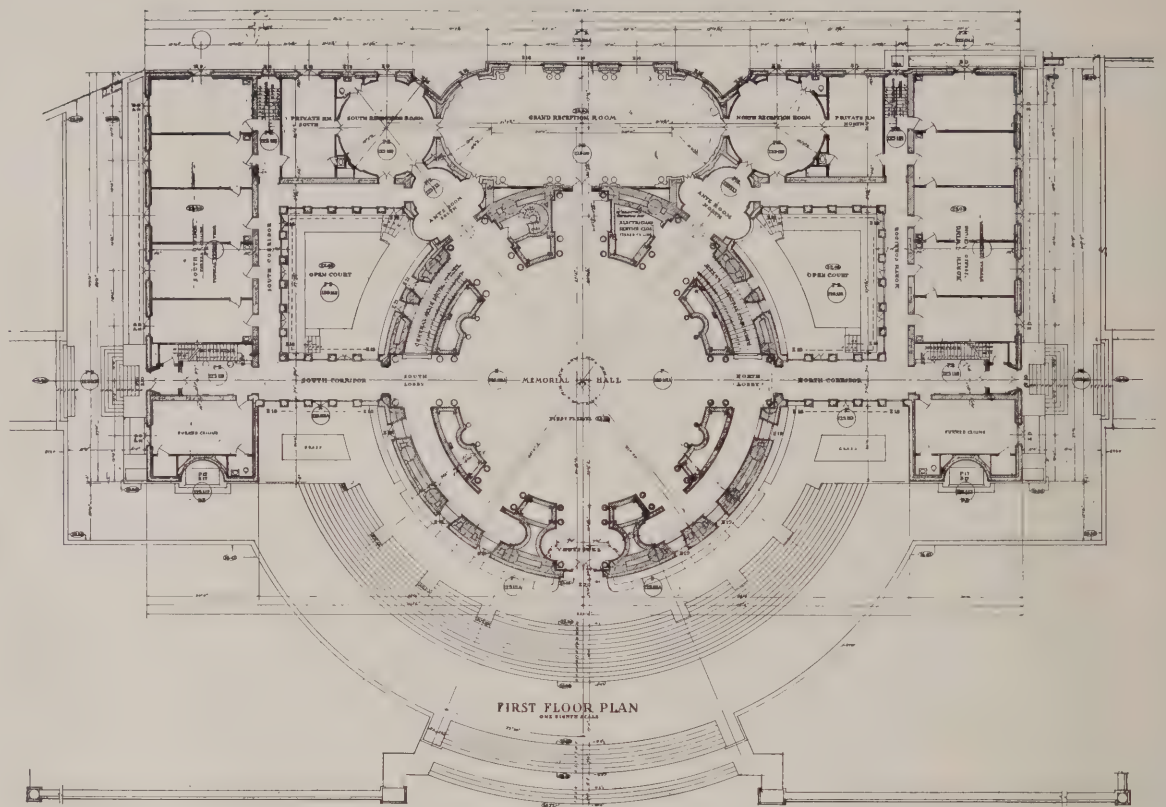
Egerton Swartwout, Architect



Photo. Paul J. Weber

Plan on Back

THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT

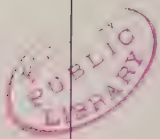
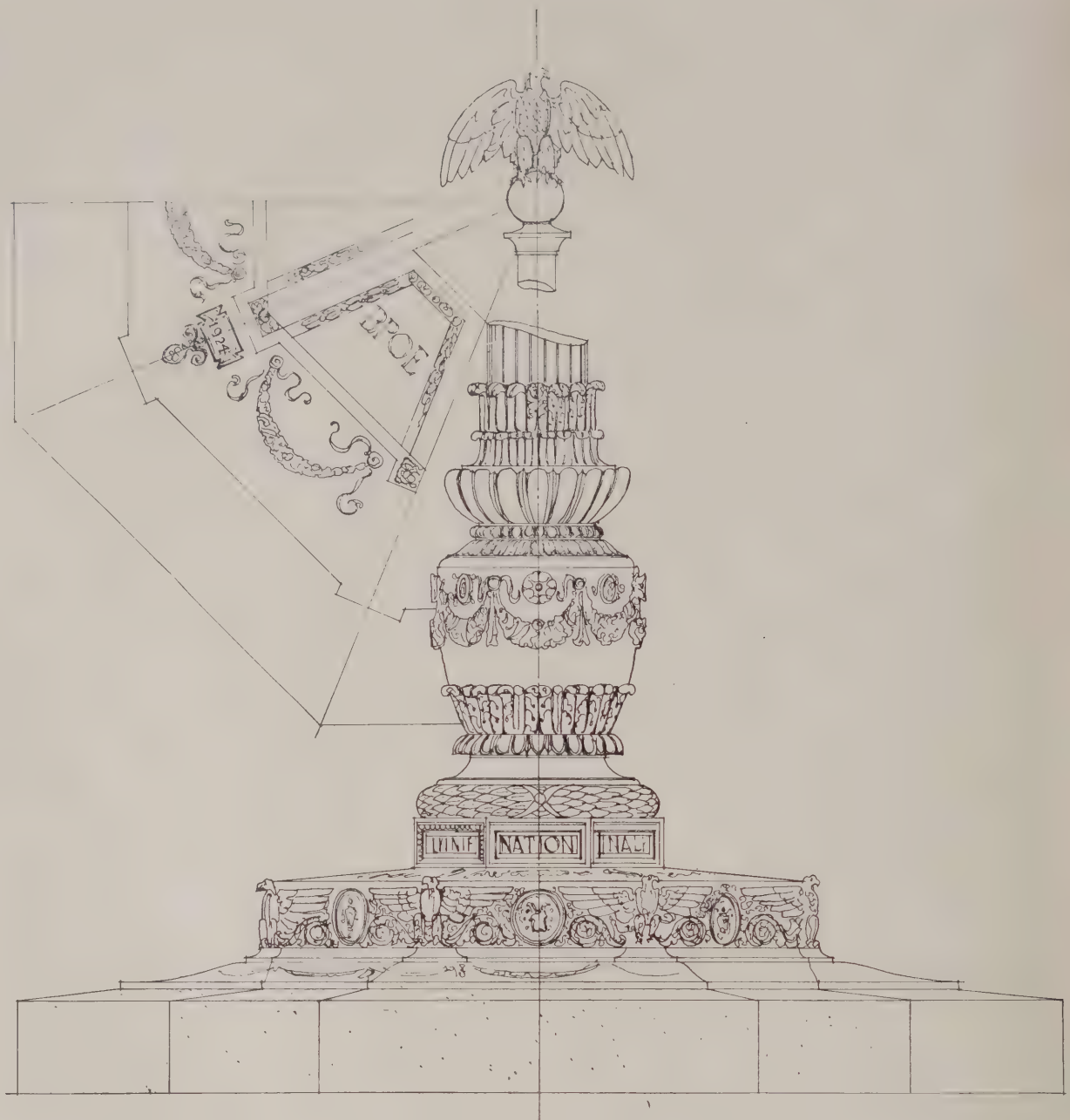




Photo. Trowbridge

Detail on Back

BASE OF FLAGPOLE
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



FLAG POLE BASE
ELKS MEMORIAL

SCALE
0 1 ft.

FEB.
1928

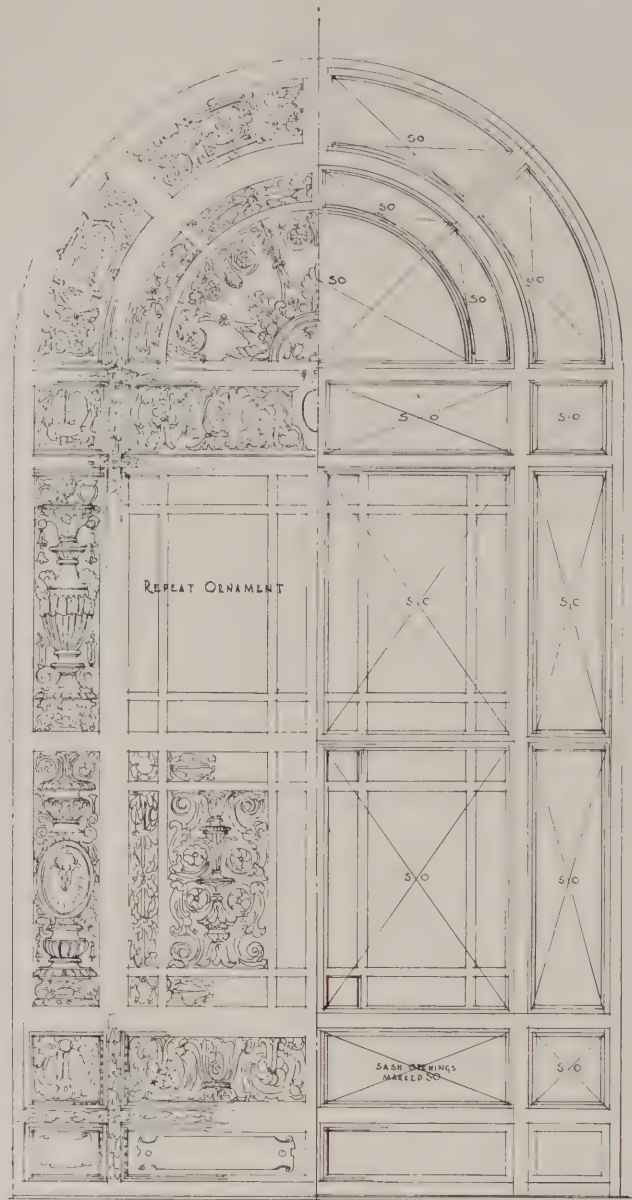
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56

The ARCHITECTURAL FORUM DETAILS



Detail on Back

BRONZE ENTRANCE DOORS
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



HALF EXTERIOR HALF INTERIOR

$\frac{3}{4}$ " SCALE DETAILS OF ENTRANCE DOOR
ELKS MEMORIAL

SCALE
0 1 2 3 ft

FEB.
1928

No.
57

The ARCHITECTURAL FORUM DETAILS

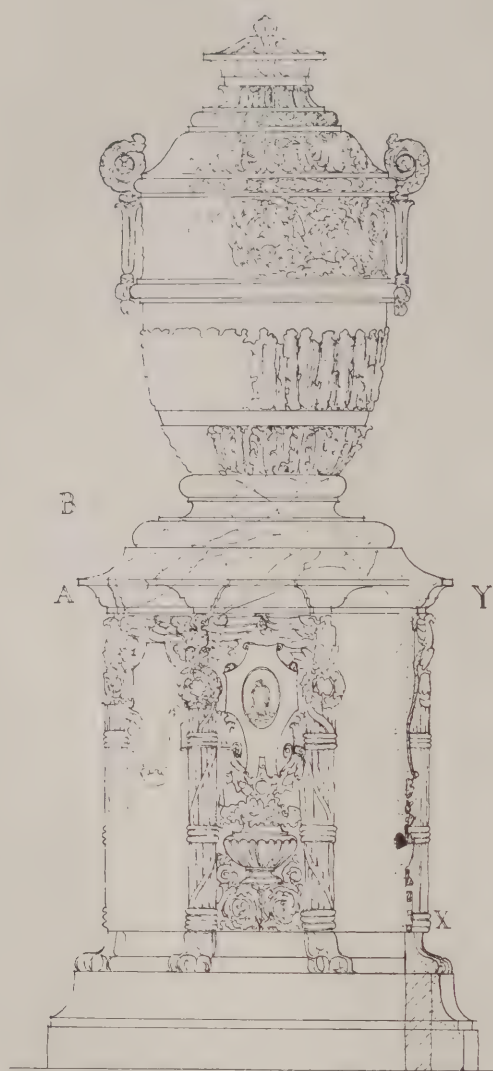


MAIN ENTRANCE
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT

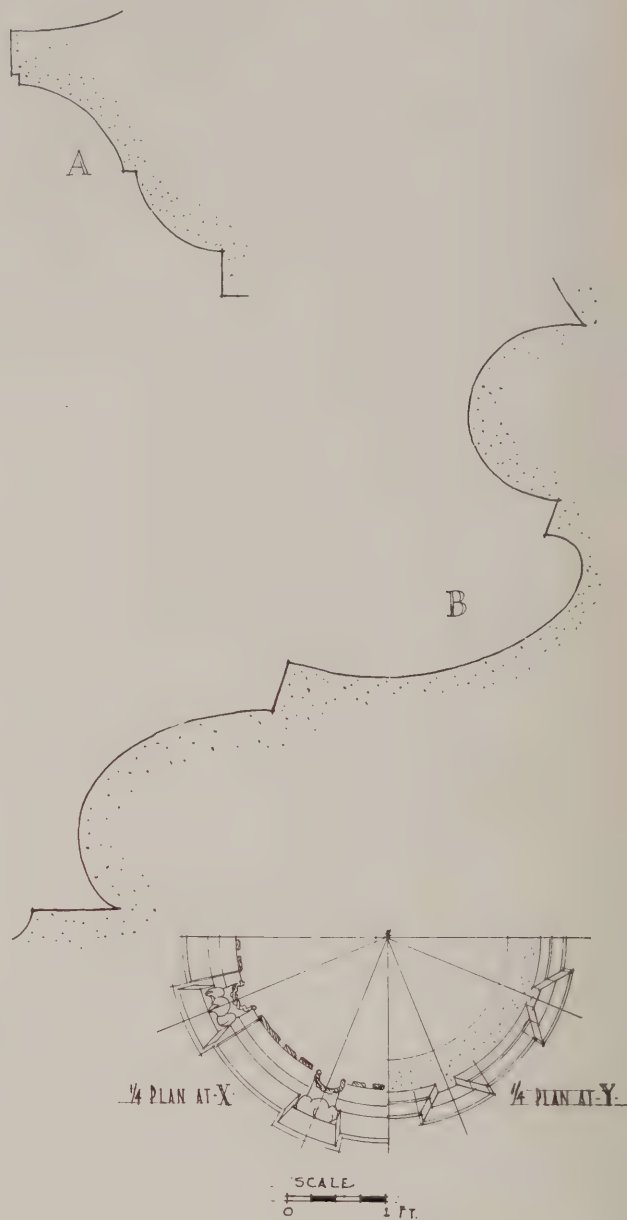


Detail on Back

BRONZE RADIATOR ENCLOSURE
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



BRONZE RADIATOR ENCLOSURE
ELKS MEMORIAL



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The ARCHITECTURAL FORUM DETAILS



MEMORIAL HALL
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



GRAND RECEPTION ROOM
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT



WINDOWS IN GRAND RECEPTION ROOM



NORTH RECEPTION ROOM
THE ELKS' MEMORIAL, CHICAGO
EGERTON SWARTWOUT, ARCHITECT

GUANAJUATO, THE MOST MEXICAN CITY

TEXT AND SKETCHES BY
WILLIAM P. SPRATLING

GUANAJUATO, a day's ride from Mexico, is there to be discovered, like a vein of rich gold ore, squeezed into a pocket between great mountains which protect and supply. Looking down into the rugged valley, the accumulation of beautiful old buildings with glazed domes and towers actually takes on the appearance of so many bright minerals,—grains of fine things that have been washed and precipitated downward into the folds of these jagged hills. Architecturally, dismantled and set up again, Guanajuato should equip ten cities with enough beautiful buildings, balconies and streets to equal New Orleans or San Francisco, which we like to call America's most interesting cities. If one of her monumental hills were added to the balance,—the kind of hills that are studded with pink and blue adobe houses,—and the summit armed with regiments of organ cactus, the result would surpass any Italian Fiesole for precipitous and surprising beauty. Not that I should like to see this place dismantled in any detail,—the allusion came in connection with a remark from one of the editors of a newspaper in Mexico who, knowing that I planned on visiting Guanajuato, remarked with conviction that there I would find Mexico's most interesting city and one very like my own New Orleans,—balconies and all. He meant, of course, that it is really Mexico's most beautiful city, which, beyond any doubt it must be.

Since Guanajuato has the further advantage of three dimensions instead of New Orleans' geographical two, as an artist I found it a constant strain not to miss some angle of the scene, everything being constantly different and of absorbing interest,—including the vertical. Furthermore, there was not the slightest danger, I discovered almost immediately, of going in a wrong direction toward dull or uninteresting territory. The plan for Guanajuato would probably reveal no squares at all, or anything that might be called "blocks." It seems to be an arrangement of triangles and hexagons instead,—never with two sides equal,—frequently with curves and, counting the almost vertical hills, sometimes spherical. Therefore, as there is no one continuous direction, the absence of street names does not cause trouble. It is a very pleasant and "intriguing" arrangement.

With the exception, perhaps, of the pretentious and grandiose *Teatro Juarez*, with a sort of Baptist church effect, and the vast city market (apparently designed after the *Petit Palais*), there is nothing extraneous about this architecturally unique city. Harmony like this is almost impossible in our United States, where building codes, materials of construction and a moving scale of building costs undergo perpetual change. Guanajuato today is still in perfect accord with the traditions of her early Spanish Colonial period,—and has been for the past four

centuries. Even use of such a logical innovation as reinforced concrete has had little effect over the simple and beautiful forms of stone construction which are universal there. It is a city of stone, adobe, and enameled tile,—not of brick and pretentious marble. The unusual variety of simple stone texture becomes, for the architect, something worth noting in itself,—white stones and pink stones and a beautiful banded green,—so delicate in its beautiful lined tints that I found myself examining one or two columns merely to see if they were not painted! The adobe, of course, is, in the more elegant streets, stuccoed and colored. Guanajuato has more color,—more paintable color,—than any city in Mexico. Naturally, our discreetly gray cities of the north would not bear mentioning in comparison. Pinks succeed greens, and pale yellow buildings may have corners banded in a sienna red. The walls of blue when in shadow match the sky above. A turn in a winding, cobbled passageway may reveal all these colors and more, and with a single shaft of sunlight the tunnel-like alleyways become as luminous and as full of pure color as a painting by Sorolla.

The city seemed to have that casual, rather intimate quality that one associates with an older, more European, civilization; as an example of this casual quality, my hotel had the advantage of nine doors opening onto the street. All nine were identical,—quite simple openings in the continuous green walls of the facade. Entering, one could discover either a lobby, a billiard hall, a very ancient saloon, a restaurant or another lobby. There being no indication or painted signs, for the stranger it became a sort of game as to how to make a choice. It took me two days to work out the scheme of direct entrance. Doubtless the older inhabitants possessed a certain advantage. In this particular hotel one could have an airy, spacious room, with tile floor (comfortable modern bed), overlooking the little triangular *jardin*, with three very complete meals per day, all for one-half the price of an interior room on the sixth floor of the sadly Americanized, plate-glass-fronted hotel such as I found in the proud city of Guadalajara.

The cemetery in Guanajuato, as one can diagnose with sufficient satisfaction from colored post cards, is a show place, but not beautiful. Incidentally, there is a splendid view of the city far below from the terrace. Within the cemetery's building there is a patio from which one is led into another world, lying only a few feet below the surface. A simple winding stone stairway, the width of one's shoulders, leads downward between the tall slabs of antique tombs into a corridor below, at the only entrance to which, piled neatly at one end, are a thousand jawless skulls and thigh bones. At the other end of this corridor one enters into a second vaulted corridor,



The Streets of Guanajuato Are Steep and Tortuous, and There Is an Infinity of Steps
From a Pencil Sketch by William P. Spratling



Squeezed in Between Jagged Hills, Guanajuato Lies in a Rugged Valley
From a Pencil Sketch by William P. Spratling



Editor's Note: Looking down upon an accumulation of beautiful old buildings with glazed domes and towers, it is a constant strain not to miss some angle of the scene, everything being constantly different and of such absorbing interest. There is nothing jarring, inharmonious or artistically offensive in Guanajuato, the most Mexican city

From a Pencil Sketch by William P. Spratling



Editor's Note: High iron fences and ornamental grille gates often enclose the elaborate Ultra-Baroco entrances to the high domed churches and cathedrals of Guanajuato, the most picturesque and beautiful city in Mexico

From a Pencil Sketch by William P. Spratling

perhaps 6 feet wide, to be grinned at in close intimacy by a hundred gesturing mummies. Here are men who were once fat, now flat and in shrunken folds, with tongues protruding and fleshless digits; babies, their bright dresses still on, standing on flattened little tubes of legs. They all stand or rather lean, on their heels, quite stiffly, against the pale blue walls. The effect is horrible and indescribable, and the fresh air becomes necessary for well-being.

But in my memory of Guanajuato there are also many other things,—splashing in the great stone pools of the Alameda, the brown bodies of Indian youths flashing in the sun. Above, an Italian blue sky and mountains towering, bristling with tall cactus. Below is a walk winding downward, beside which runs the silver thread of a small stream. There is a gigantic growth of tropical gardens, with many

stone bridges of primitive shapes. The declivities are steep and tortuous, and there is an infinity of steps,—steps frequently ingeniously contrived. It is a city of steps. There are more stepped streets in Guanajuato than there are bridges in Venice! Up them, driven by Indians, with simple white clothes and bright *serapes*, go small trains of burros laden with casks of wine, with loads of wood,—arranged with match-like precision,—and with individual mountains of hay in nets. Automobiles find Guanajuato's streets difficult. It is not a place intended for them, and they look as awkward and uncomfortable lumbering around the narrow slanting byways, as country clowns in a boudoir. As for myself, I found Guanajuato so rare in its beauty that my only regret was that I did not have the leisure in which to put more of the things that I saw there on paper.



High Domes and Vaulted Roofs Tower Above Fortress-like Walls and Parapets

MEXICO AND THE ULTRA-BAROCO

BY

DR. ATL

FORMER DIRECTOR OF FINE ARTS AND MINISTER OF EDUCATION IN THE MEXICAN GOVERNMENT

THE religious architecture in "New Spain" was initiated in the very first days of the Conquest with the erection of modest adobe-built oratories. Its development was carried on during those years under the exclusive influence of European styles, imported since the early days of the conquerors, and it reached, starting from 1640, a prodigious development which finished in 1700 with the magnificent florescence which we recognize as typically Mexican. These works, inspired directly by the European styles, were nearly all erected between 1540 and 1620 and form a series of types of great artistic interest but lacking the imprint of native impulse. Beginning in 1620, the religious buildings are simple structures of very elementary character, generally built upon rectangular plans and without a well fixed scheme of arrangement or ornamentation. The number of these structures constantly increased until 1650, from which date on to 1700 construction was constantly accelerated, and it finally reached its amazing maximum of ten churches monthly.

At the beginning of the eighteenth century the political and religious unification of the colony had been completed. The ideals and interests of the new social group formed in "New Spain" were crystallized, and this crystallization was meant to be the base of the development of a new and magnificent art, essentially Mexican. Some of the artistic virtues which were native, and others born from the blending of the two races—the native and the Spanish—had their first distinct and independent expressions in this architectural development. The Catholic Church had consolidated its power, and its wealth was enormous. The moment was propitious for a great artistic expression, one which transformed the styles imported from Europe and blended them with a very real national sentiment. On the vast territory of "New Spain," during the eighteenth century, and, at the same time in other regions, thousands of churches were erected having fundamentally the same characteristics—confessing the same origins—revealing the same tendencies; buildings which were almost always anonymous, and which distinguish themselves at a single glance from the Italian and Spanish buildings from which they had derived some manners of construction and ornamentation. The fundamental elements of the religious architecture of the seventeenth century are of *Baroco* origin, but the master builders, the anonymous masons and the great architects, exaggerated the original forms and covered them with a richly imaginative decoration, transforming the facades, towers and cupolas of the churches, and resulting frequently in "ornamental explosions."

On the other hand, and with the exception of great churches erected by known architects and constructed

along perfectly definite plans, the immense majority of churches of the eighteenth century are true "*obras de acumulacion*," extremely asymmetrical and of a lineal expression which is energetic and at the same time accentuated by the vigorous eloquence of polychromy. This manifestation has been classified by those interested in Colonial architecture under the denomination of "*Estilo Churrigueresco*," "*Estilo Plateresco*," "*Baroco Espanol*," etc. There is nothing more absurd. The series of architectural works of the seventeenth century have essentially Mexican characteristics and cannot be confused with those of Churriguera, Tome, Pedro Ribera, Miguel de Figueroa, etc. In my monographs "*Iglesias y Conventos de Mexico*," published under the patronage of the Treasury Department of the Mexican government, are more fully given the reasons which induced the establishment of the new classification and which define more logically these characteristics of the seventeenth century production. After a vast comparative study among Mexican works, in which I am still engaged, and of the products of the Italian *Baroco*, the Spanish *Baroco*, and the so called "*Escuela Salamantina*," and after examining closely the special forms of the new artistic product, I considered it logical to include the eighteenth century's productions under a denomination which would correspond exactly to their character and which will determine exactly their origin and their tendencies. I have called it "*Ultra-Baroco*" with which is indicated a derivation of the *Baroco*, and,—which is more important,—that it proceeds further. The *Ultra-Baroco* is expressed by exaggerated movements of the masses, by abundance of ornamental motifs, by vigor of chiaroscuro, by the invariable desire for vibration and depth, by the ascendent rhythm of the frontispieces, by the tendency to terminate the facades and the walls with *ondulant* profiles which are invariably dominated by the magnificence of a polychromed cupola and dome. This means that the builder of the seventeenth century, famous architect or anonymous mason, expressed himself in Mexico in a language of *Baroco* origin, but enriched it by a profound æsthetic sentiment which is tropical and therefore distinctly and characteristically Mexican.

William P. Spratling, since the first days of his arrival in Mexico, was strongly attracted by the aspect of the *Ultra-Baroco* constructions. After several trips to different regions of the republic, he seems to have had the artistic sensibility to grasp the constructive tendencies and the plastic value of this truly Mexican style, to which are related the greater part of the admirable drawings which illustrate this article and others by him previously published in THE ARCHITECTURAL FORUM. There is

no form more adequate to translate to a public the true aspect of the picturesque Mexican churches than that chosen by Mr. Spratling. His drawings, deeply sensitive, probably express much more as regards clear facts than any other possible form of graphic reproduction. The cupola, which is one of the most important manifestations of the *Ultra-Baroco*, an obsession of the builders of the seventeenth century, seems also rather an obsession with Mr. Spratling. In the pages of this magazine he has shown from time to time some very rare examples. The cupolas, rising above the naves of the temples, represent the spiritual expansion of a religious sentiment. Born in the East and transplanted to the Occident, the cupola flourished above the churches in the countries of the sun and had one of its greatest expressions over the polychromed walls of Santa Maria dei Fiori. Transported to Mexico, this exquisite architectural

conception was developed on the old Anahuac land,—which had not known the curve,—and there flourished prodigiously. Mexico has nearly 15,000 cupolas!

Wandering through the wonderful provinces of the republic, as has Mr. Spratling only recently, and from which journeyings there have been such wonderful fruits, is an experience sufficient to convince one that in these Mexican things are encountered manifestations disclosing a new plastic value and one hitherto unclassified. As a matter of fact, the *Ultra-Baroco* represents the first intellectual effort of "New Spain." It might almost be said that the *Ultra-Baroco* in Mexico constitutes, with its innumerable examples, an intermediate point between the Aztec Teocali and the New York skyscrapers. It is a unique fact that in the creation of the *Ultra-Baroco* there was won architectural independence preceding by a whole century the political independence of Mexico.



High Walls Are Dominated by the Magnificence of a Cupola or Dome, as in This Church at Chihuahua



THREE HOUSES IN THE "MEDITERRANEAN" STYLE—NO. 1

House of O. N. Gabriel, Esq., San Marino, Calif.

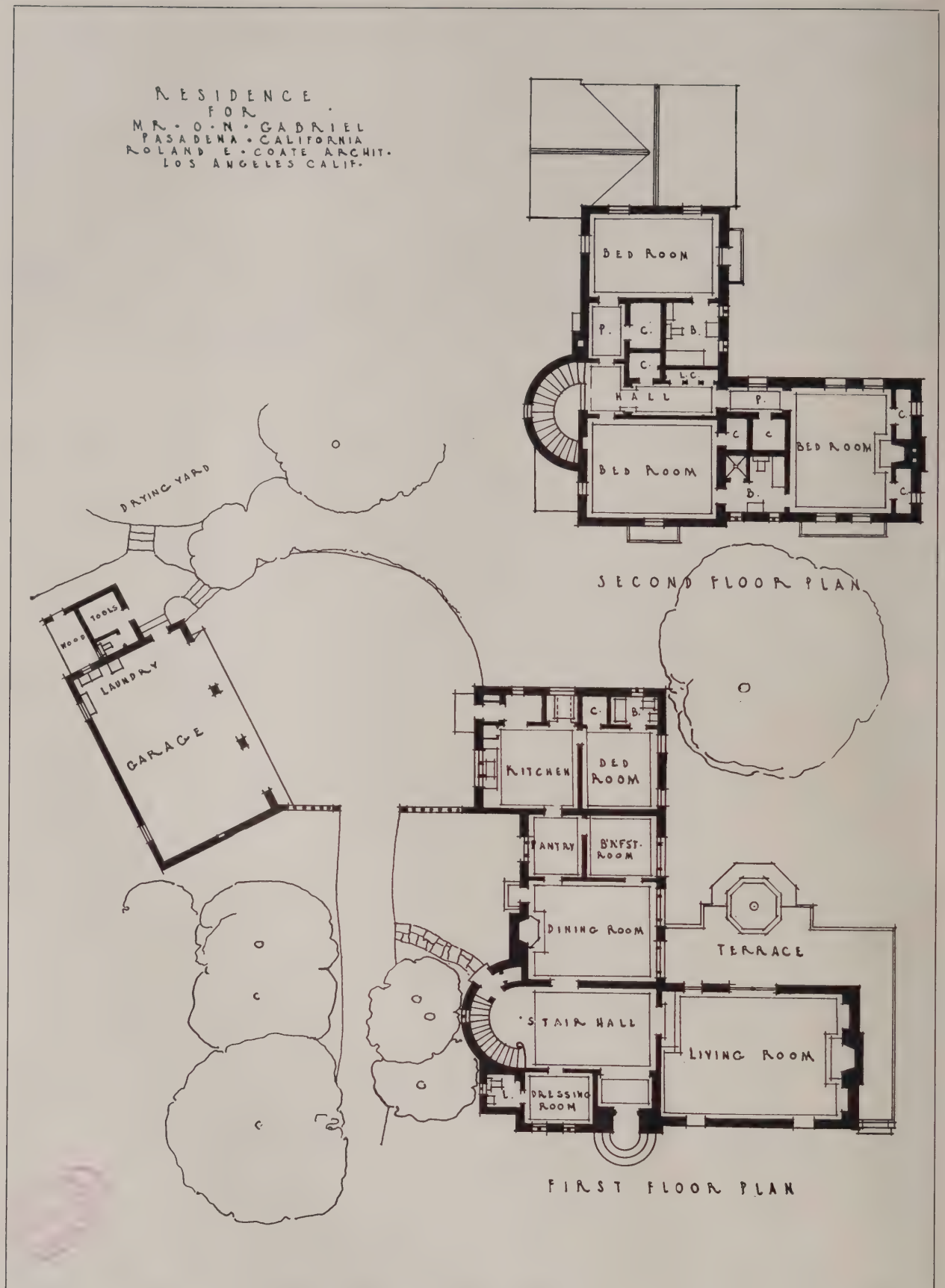
Roland E. Coate, Architect

THE consistent and successful use of the "Mediterranean" style in American domestic architecture is nowhere seen to better advantage than in this unusually artistic house of Mr. Gabriel's in San Marino, Calif. The house, which is remarkable in plan, is so located that many of the original trees on the site have been preserved to add charm and picturesqueness to the setting. Unlike the majority of Spanish and Italian houses in southern California, this building is constructed of brick painted white instead of the usual stucco-covered tile more frequently used. The roof of Spanish tile, the iron balconies and the green shutters contrast pleasantly with the white of the walls. The one-story service wing which contains the kitchen, pantries, servant's bedroom and bath, emphasizes the height and importance of the main portion of the house. The plan of the first floor is so laid out that the living room and dining room both open onto a terrace, with a central fountain located in the angle formed by the main house and the living room wing. Three large arches, which open out of the dining room and breakfast room, make a picturesque background for this terrace. On the other wall of this court a large rectangular window and small door indicate the location of the living room.

Although the design of this house is dis-symetrical, the windows and doors are so carefully studied as to scale, location and centering that there is a definite note of formality about this otherwise informal layout. The same restraint and stylistic conservatism are shown in the interior architecture. Black and white marble floors, soft tinted stucco walls and gaily painted coffered ceilings produce a "Mediterranean" atmosphere in which the massive Italian and Spanish furniture is in perfect keeping. To properly appreciate the unusual charm of this delightful house, these illustrations should be reproduced in color; unfortunately, the richness and harmony of the color combinations can only be imagined. Added

height is secured for the living room by dropping the floor two steps below the level of the rest of the first floor. The entrance hall with its semi-circular stairway is almost as large and impressive as the living room. It is to be regretted that no illustrations of the dining room were obtainable, as this room, judging from the plan, must be unusually interesting. One end is occupied by the two great arches which overlook the terrace, and a massive fireplace occupies the center of the opposite wall. Even the small doors into the pantry and breakfast room balance each other at similar distances from each corner of the room. Probably some personal preference on the part of the owner necessitated the placing of the large arched doorway from the stair hall into this room considerably off center. The bay of the semi-circular stairway forms an interesting architectural feature on the exterior of the house. Under the stairs there is conveniently located a side door, which leads out toward the garage and service courtyard.

The high fence with its tall brick piers and turned spindles is one of the picturesque details of this fascinating architectural group. Penetrations in the brickwork of both house and garage are pleasant decorative notes, as are also the black-painted iron balconies with their gay striped curtain awnings. On the second floor are located three good-sized master bedrooms, two baths, and many spacious closets. So large is the master portion of this house on both the first and second floors that it would seem necessary to have more than one servant's bedroom in permanent residence, although only one servant's bedroom has been provided. The picturesque charm of this house can be readily appreciated from the illustrations. Most of the appeal of the design is due to the large amount of unbroken wall surface and to the carefully proportioned and properly located door and window openings. It is to be wished that more of the California houses built from designs inspired by Spanish architecture could be as satisfying as this house.



Editor's Note: The plot plan was laid out to save all large trees on the property. Service courtyard and garage logically located at rear of house. Living terrace and garden have proper privacy and seclusion. A well planned house, well placed



ENTRANCE PORCH FROM DRIVEWAY. OPEN DESIGNS IN THE BRICKWORK REPLACE WINDOWS
HOUSE OF O. N. GABRIEL, ESQ., SAN MARINO, CALIF.
ROLAND E. COATE, ARCHITECT



CORNER OF THE LIVING ROOM WING AND NARROW TERRACE LEADING TO THE GARDEN
HOUSE OF O. N. GABRIEL, ESQ., SAN MARINO, CALIF.
ROLAND E. COATE, ARCHITECT



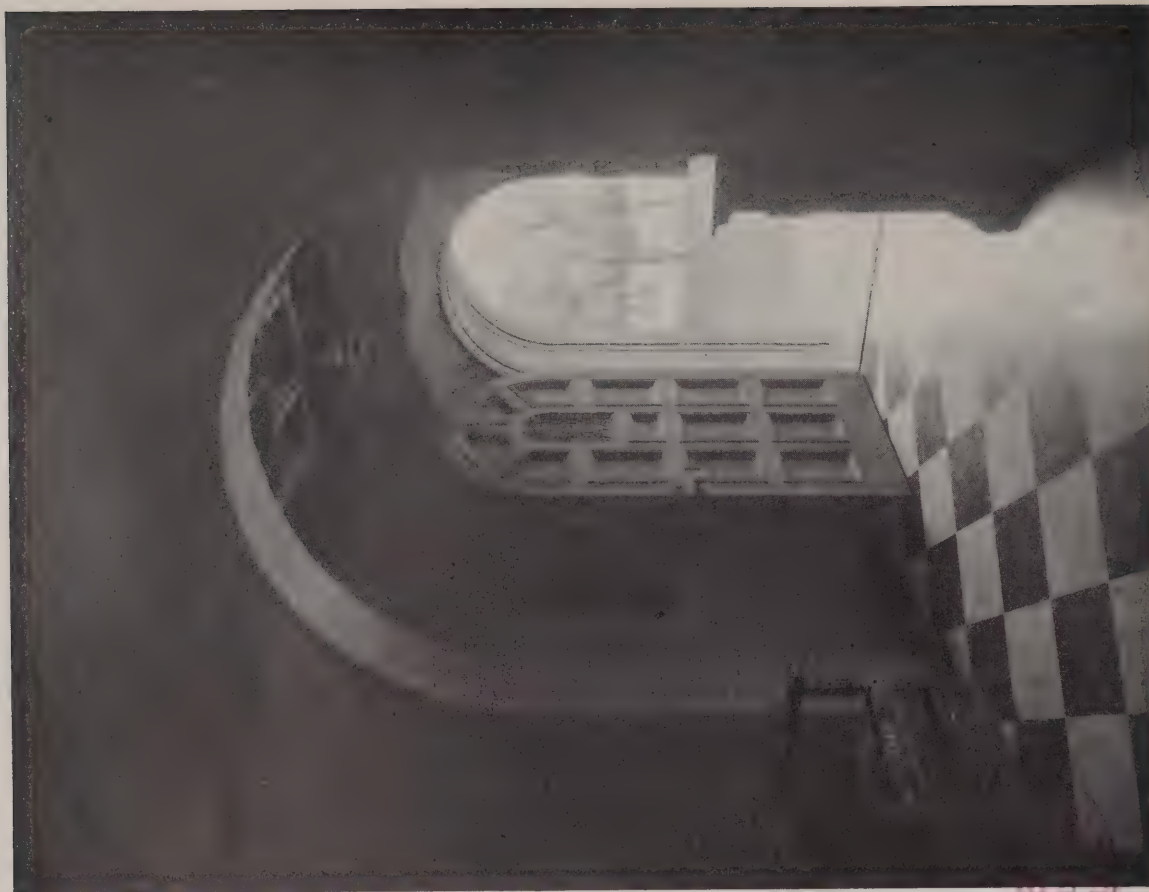
THE LEADED GLASS IN WINDOW OF STAIR HALL BAY IS BARELY DISCERNIBLE IN THIS ILLUSTRATION
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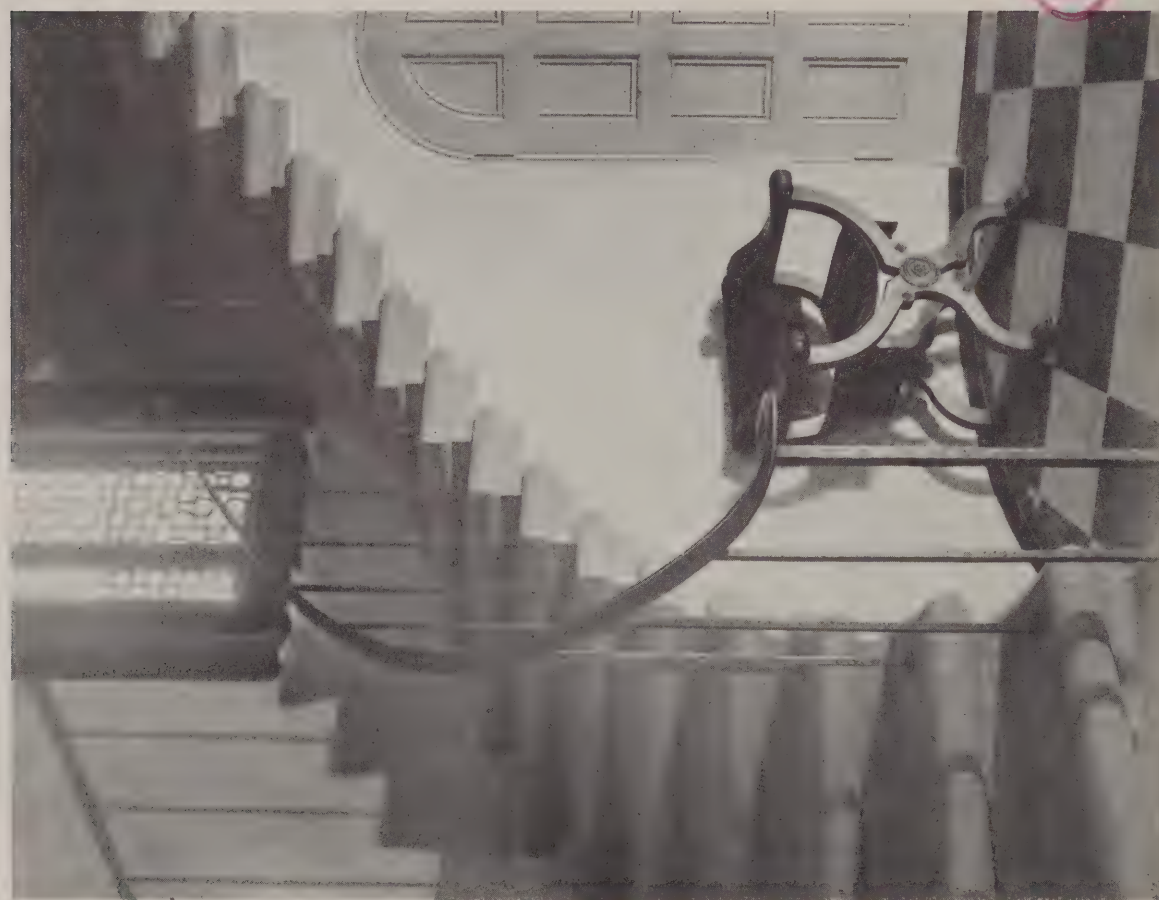
A CORNER OF THE GARDEN TERRACE, WITH SPANISH FOUNTAIN AS THE CENTRAL FEATURE
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STAIR HALL FROM LIVING ROOM

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THE GARDEN TERRACE



GARAGE AND GATEWAY TO SERVICE COURT
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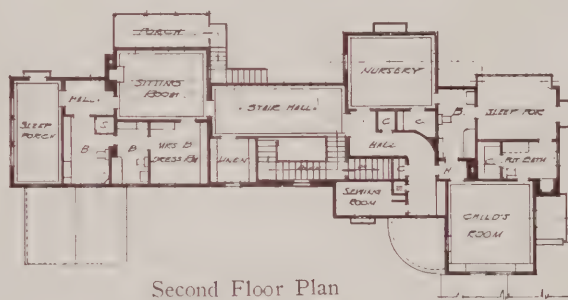


THREE HOUSES IN THE "MEDITERRANEAN STYLE"—No. 2

House of Milton Baruch, Esq., Holmby Hills, Calif.

Gordon B. Kaufmann, Architect

RESERVE and refinement produce the charming simplicity of this house at Holmby Hills. From the illustrations it might be thought that this is a house of moderate size. As a matter of fact, it rambles over a great many square feet of ground. It is a house designed for recreation and entertainment. In the long, one-story wing rooms are provided for four servants. People who build homes for themselves, if they desire freedom from the servant problem, should make them thoroughly comfortable, and follow the example laid down in this plan, where not only are the four servants' rooms of more than average size, but where also a dining room and a porch, which appears on the plan more like an additional room, are provided for the comfort and convenience of the servants. Although this house is of tile covered with stucco instead of brick painted white, it shows many of the characteristics in its design that are found in the house of Mr. Gabriel at San Marino. From every point of view, this house has a distinctly picturesque quality, as may be seen from these illustrations.



Second Floor Plan



First Floor Plan



ENTRANCE, HOUSE OF MILTON BARUCH, ESQ., HOLMBY HILLS, CALIF.
GORDON B. KAUFMANN, ARCHITECT



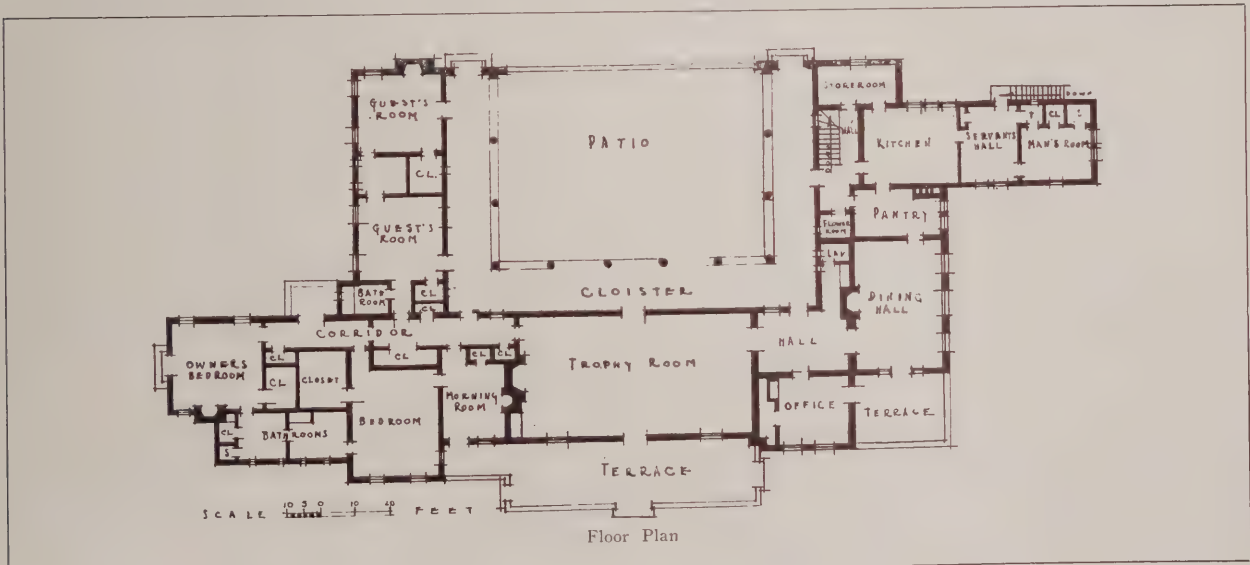
GARDEN TERRACE, HOUSE OF MILTON BARUCH, ESQ., HOLMBY HILLS, CALIF.
GORDON B. KAUFMANN, ARCHITECT



LOGGIA, HOUSE OF MILTON BARUCH, ESQ., HOLMBY HILLS, CALIF.
GORDON B. KAUFMANN, ARCHITECT



THREE HOUSES IN THE "MEDITERRANEAN STYLE"—No. 3
House of Max Fleischman, Esq., Montecito
Johnson, Kaufmann & Coate, Architects





Corner of Patio and Cloister



Steps at End of Patio Cloister

WITH the mountains and valleys of Montecito as the setting, it is not surprising that an architect could be inspired to create a house of unusually artistic and picturesque quality. In any case, it is evident that the architects who designed this wide, spreading, one-story house for Mr. Fleischman were inspired to create a design in which details rather severe and formal in themselves are so artistically combined as to produce a house almost theatrical in its picturesqueness. Who can explain why an arched opening has so much more appeal to the artistic eye than the flat-top or rectangular opening? Certain it is that no prettier picture could be imagined than the view of the verdant valleys and rose-tinted mountains enframed by the open archways at each end of the covered walk or cloister that surrounds the broad patio. This patio logically separates the dining and service part of this one-story house from the master's or living part. A large center hall, known as the "trophy room," over 40 feet in length, connects the two parts of this plan. The four bedrooms, several baths, large closets and the morning room occupy the master's part of the plan. The side hall, office, large dining room, pantry, kitchen, store room and the servants' quarters occupy the other half of the house. As only one servant's room appears in the plan, it is presumed that quarters outside the house must be provided for more servants.

Most of the pleasing quality of the exterior design is due to the large amount of unbroken wall area

and to the care taken in the proportions, scale and locations of the several door and window openings. Such all-important factors in good design as scale and proportion are almost impossible to teach. No hard and fast rules for these primary essentials can be laid down. They are the product of innate good taste and artistic appreciation. The evidence of these characteristics is particularly evident in the details of the entrance facade, where two windows with green shutters balance a center entrance door. This excellently proportioned opening is balanced by an interesting lantern on each side and is given added importance by the rainwater leaders which are so located that they purposely divide the design of the entrance front into three parts. To give scale to these three principal openings on the front facade and to break the bareness of the high wall spaces above these three openings, small, square, porthole-like windows are introduced just below the overhanging eaves. The broad terrace at the front of the house, which gives an appearance of solidity and permanency, further adds to the distinctly architectural quality of the entrance front. The architects were doubly fortunate, as not only the views of the surrounding country on every side were beautiful, but the actual site itself possessed many old trees of picturesque shape and character. It is indeed a pity that houses designed in the Italian and Spanish styles are not consistent with the climate and life in most sections of our country except Florida and California.

INTERIOR ARCHITECTURE

SALLE PERRIN, MUSEE DES ARTS DECORATIFS, PARIS

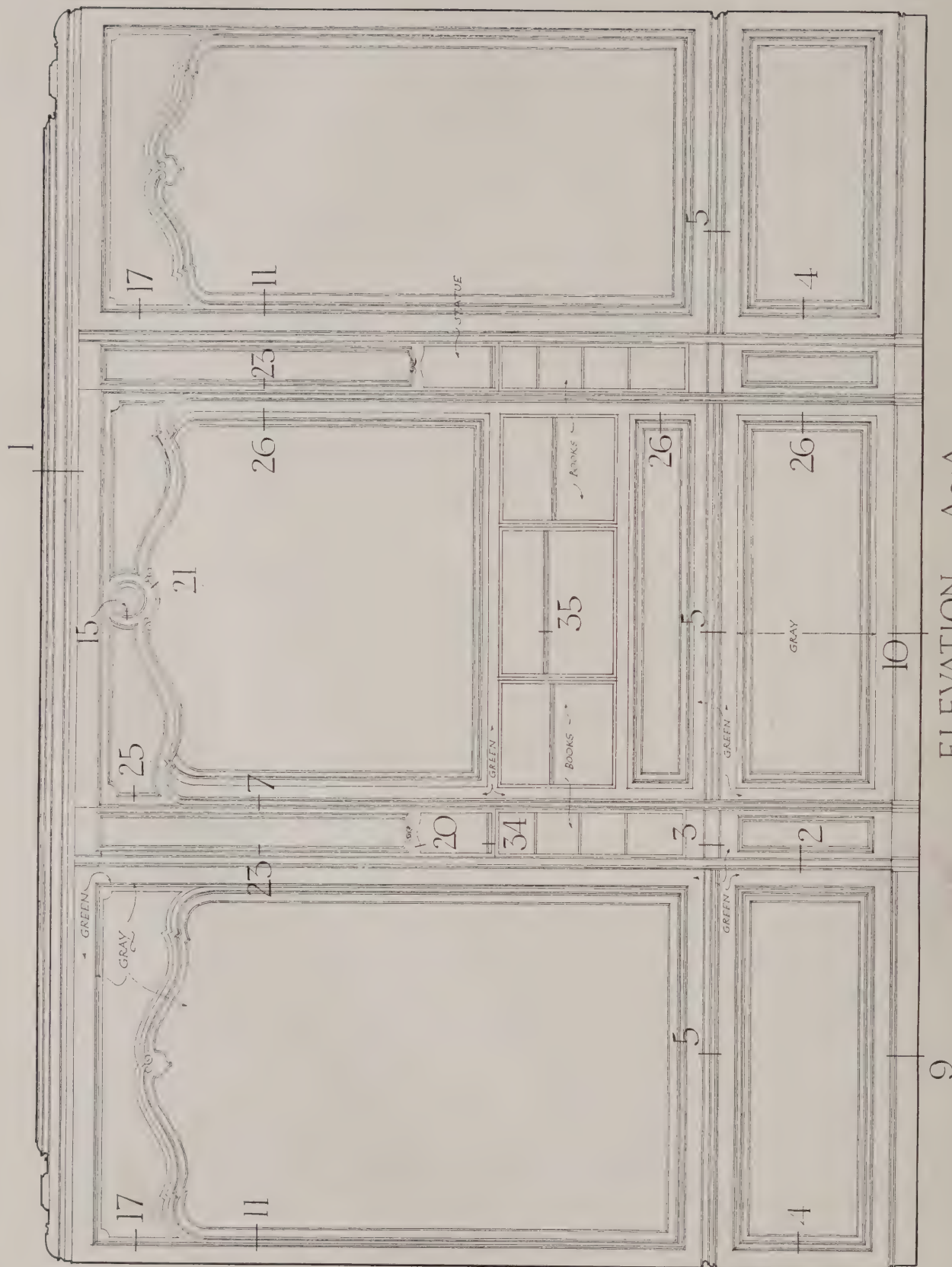
TEXT AND MEASURED DRAWINGS BY
C. HAMILTON PRESTON

IN the extreme western part of the Louvre one finds a huge wing devoted entirely to the history of the development of interior architecture and decoration from the earliest times to the present day. This wing is known as the Musée des Arts Decoratifs. The subject of these measured drawings is found in the purely eighteenth century section of this wing. Here a series of rooms has been arranged, some antique, and some modern copies of antique rooms, to serve as settings for the priceless collections of art objects and decorations which have been brought together here to exemplify the beauty of the various periods of this unparalleled era. One of these rooms is the Salle Perrin, perhaps the most interesting of them all. It is a copy of an antique room in the possession of the donor, M. Perrin, and was given as a memorial to his son. Of the Louis XV period, it is unique in both design and color. One sees at a glance that it is rather provincial in character and yet of finish and refinement in design, possessing nothing of the seeming crudity of much of the provincial work. In its conception it is extremely broad and vigorous.

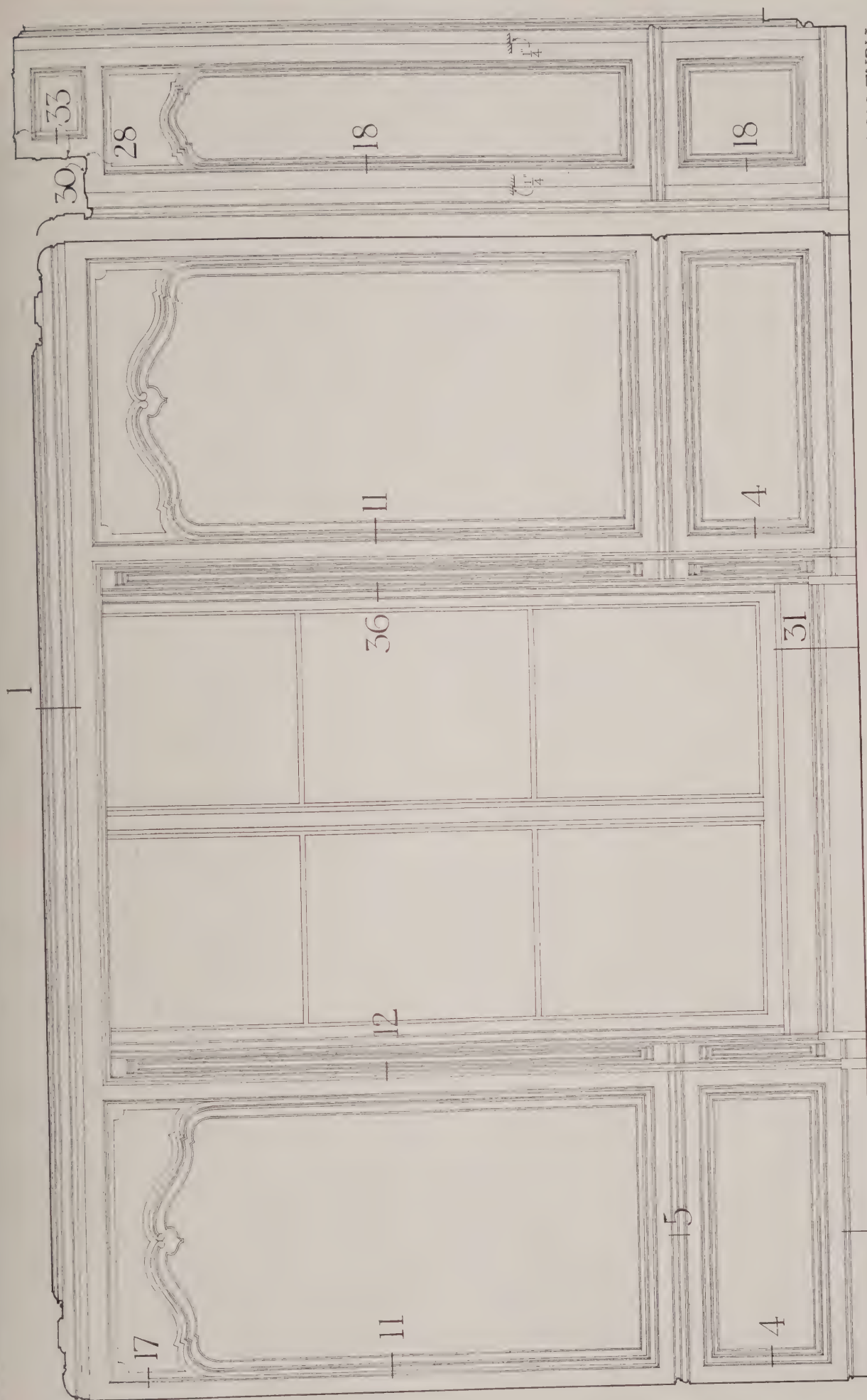
Rarely does one find such breadth of paneling, such varied and long forms of curves; in fact it is almost Georgian in feeling. It is a room of the utmost distinction and forms a very fitting setting for the beautiful objects with which it is filled. The end opposite the window and illustrated with this text gives, from the point of view of design, the keynote of the room. In the center we find a shallow niche, flanked by small recesses or subordinate niches into which books are set, surmounted by brilliantly colored Buddhas. The books are in brass rimmed bookcases, very delicate in scale, both in these flanking niches and in the rear of the large niche. As will be seen from the sketches, this niche, which has a sloping soffit and is exquisitely paneled, forms a setting for the beautiful Louis XVI desk which occupies it. The two adjacent sides are fittingly paneled to receive the furniture and decorations with which they are adorned, while the fourth has been ingeniously designed to incorporate one of the huge windows of the Louvre. The stiles are dark olive green, mottled, and all panels and mouldings are of a warm gray, which is slightly marbled.



Wall with Niche, Salle Perrin, Musée des Arts Decoratifs, Paris



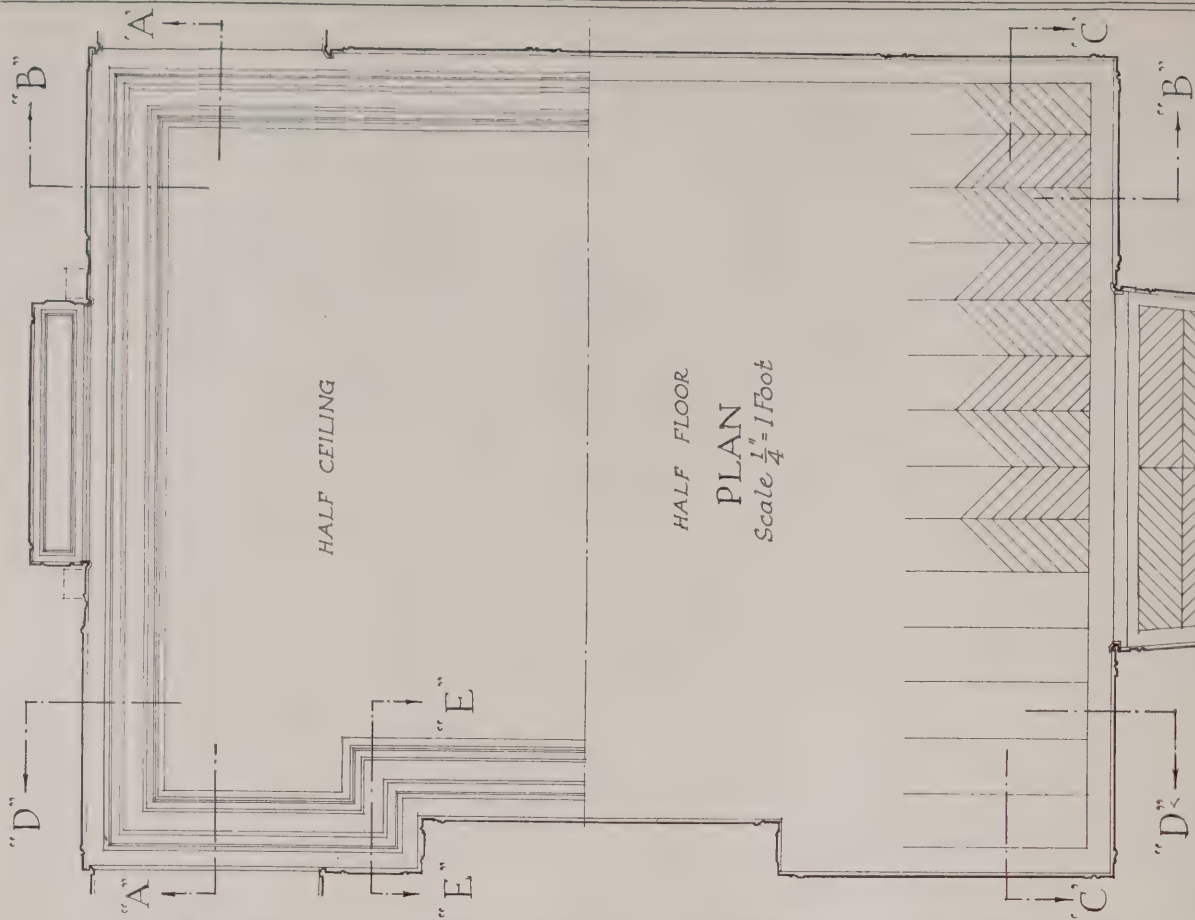
ELEVATION A~A
 SALLE PERRIN
 MUSEE DES ARTS DECORATIFS
 PARIS
 Scale 1/2" = 1 Foot



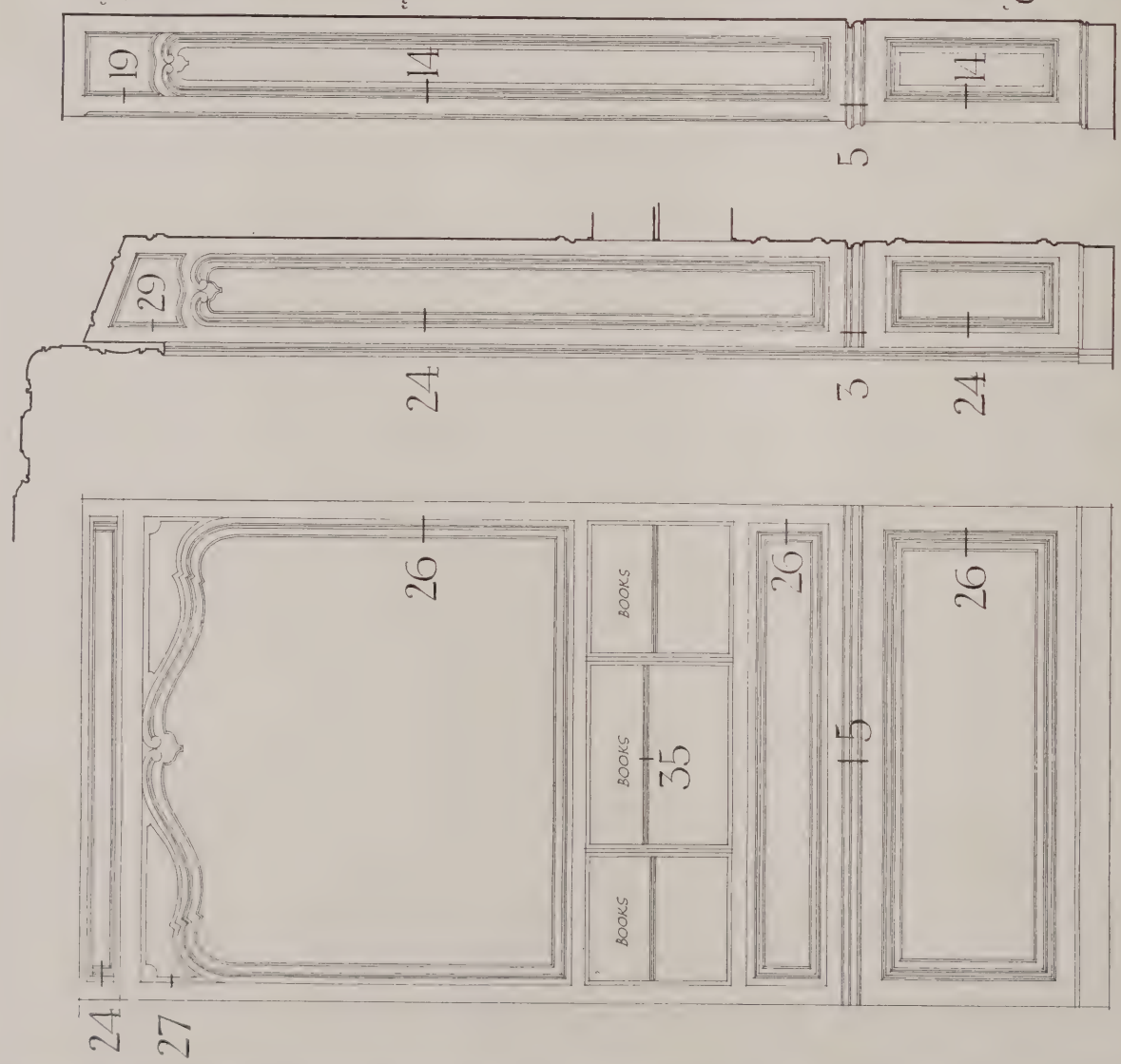
SECTION THRU
WINDOW

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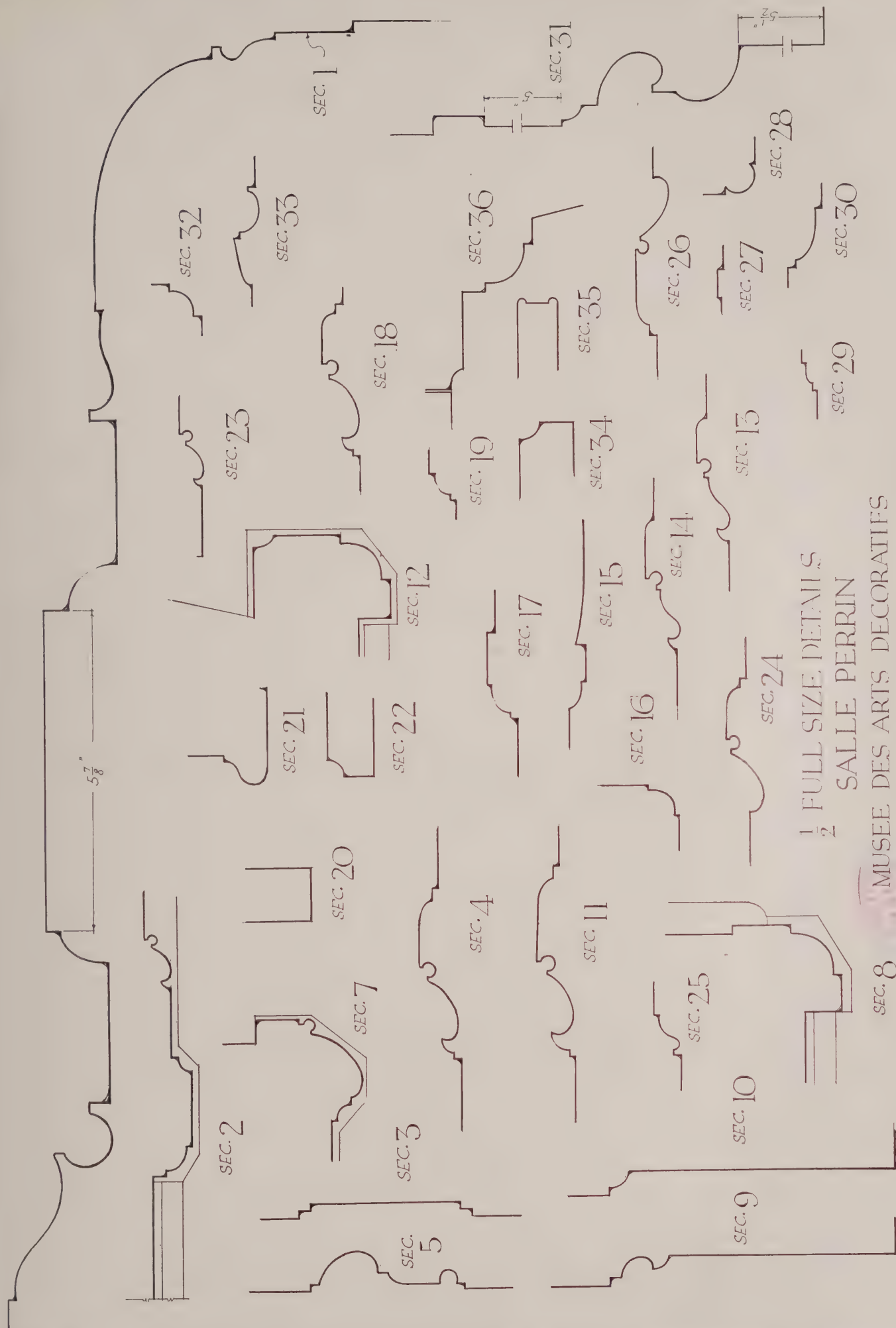
ELEVATION C~C
SALLE PERRIN
MUSEE DES ARTS DECORATIFS
PARIS
Scale $\frac{1}{2}$ " = 1 Foot



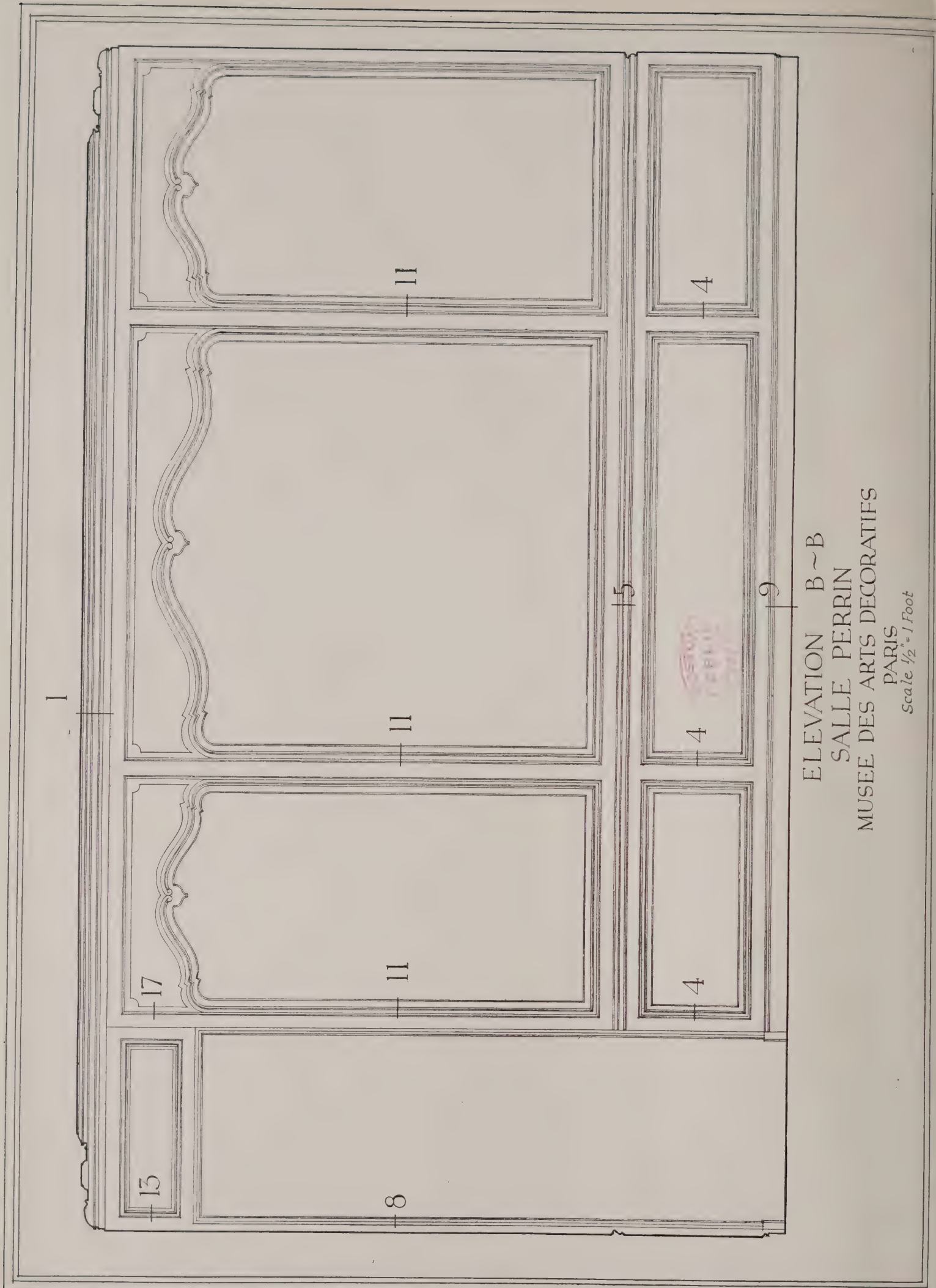
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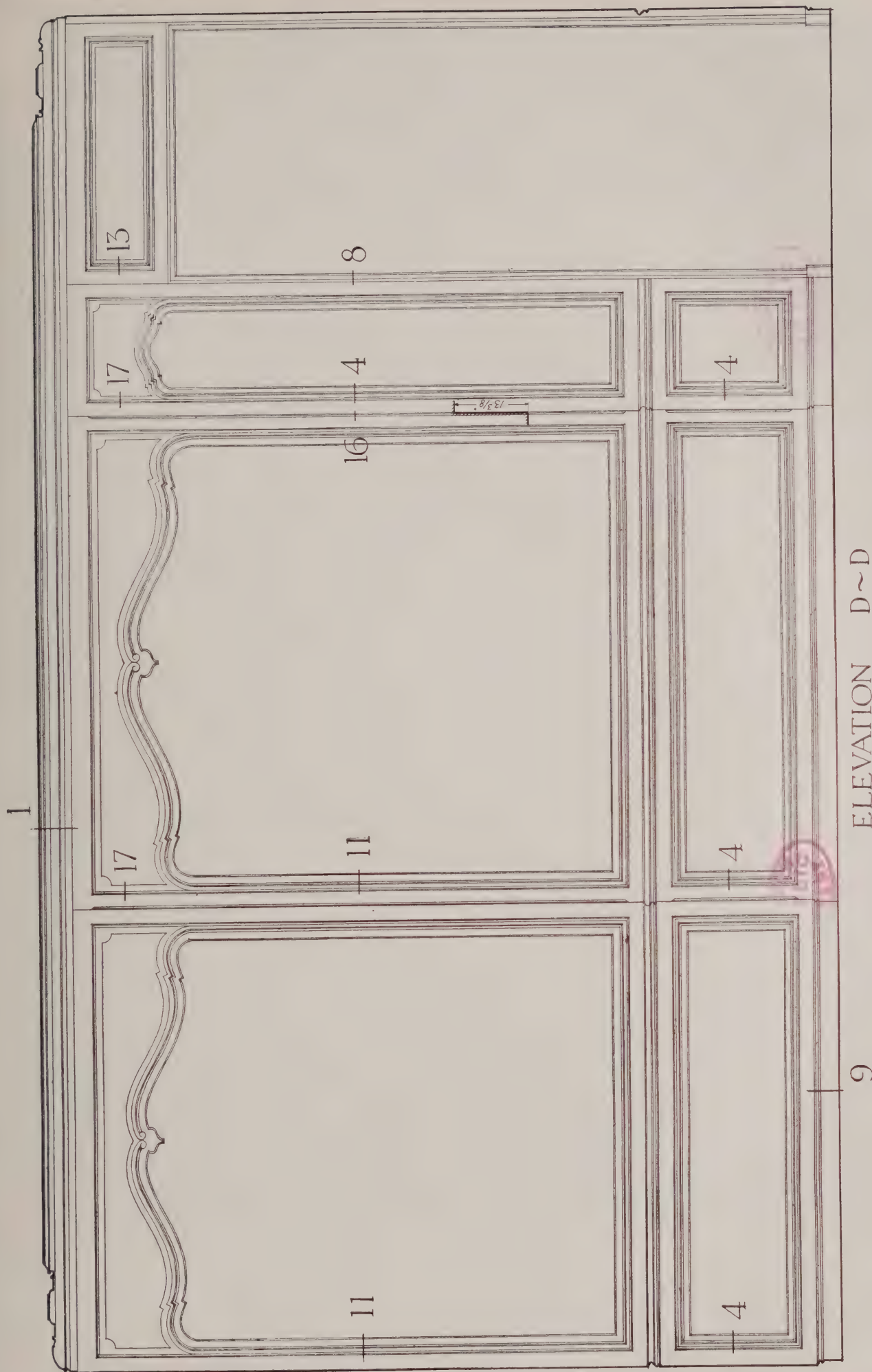
ELEV. "E~E"



1 FULL SIZE DETAILS
 2 SALLE PERRIN
 MUSÉE DES ARTS DÉCORATIFS
 PARIS



ELEVATION B~B
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 PARIS
 Scale $\frac{1}{2}$ " = 1 Foot



ELEVATION D~D
 SALLE PERRIN
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 PARIS
 Scale 1/2" = 1 Foot



EMPHASIS IS GIVEN BY THE SLIGHT PROJECTION OF THE CENTER PANELING ON ONE WALL OF THE SALLE PERRIN, MUSEE DES ARTS DECORATIFS, PARIS

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FRANK W. SKINNER, C.E.

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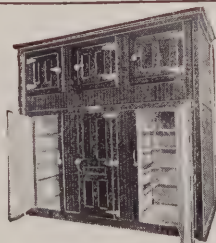
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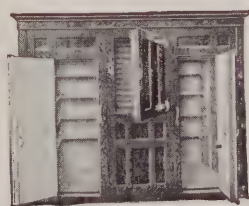
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mum strengths vary from 850 pounds to 4,600 pounds.

The 30 specifications for preservative coatings include those for raw linseed oil, turpentine, zinc oxide, white lead, red lead, iron oxide, and other pigments. Properties, composition and methods of testing are given. The specifications for joists, planks, stringers, and posts, with an appendix, tables and formulæ for working stresses, afford a comprehensive treatise on the classification, properties, treatment, defects, and proper uses of timber that should be of unusual value in design and construction. There are 25 specifications for use of waterproofing methods and for materials and fabrics, and tests for roofs, walls, floors, etc. There are seven specifications for insulating materials and their proper tests.

AMERICAN SOCIETY FOR TESTING MATERIALS STANDARDS, 1927. Two vols., 6 x 9 inches. Published by the American Society for Testing Materials, 1315 Spruce Street, Philadelphia. Vol. I, 871 pages, \$7.50. Vol. II, 1,000 pages, \$7.50.

ELEMENTARY BUILDING SCIENCE, By Alfred Everett. 159 pp., 5¼ x 8½ ins. Price \$2.50. Oxford University Press, 35 West 32d Street, New York.

PRESENT-DAY builders are confronted with the necessity of learning the best uses of countless new structural materials and likewise with becoming conversant with new methods of using in many instances materials which are well known. The excessive cost of building in any form today renders necessary the use of many economies and "short cuts" which are wholly legitimate, and likewise the avoiding of certain other means of saving which are not favored by careful builders. The responsibility, in fact, is not entirely that of building contractors, for architects, and particularly architects' specification writers, must assume their share of responsibility when it comes to securing the utmost in honest building for each dollar of the client's appropriation.

All this has brought construction to what the author of this work terms a "science." In the preface he says: "The title 'Building Science' has been adopted with a certain amount of hesitation. No new subject is implied, but rather the application of physics and chemistry to building and building materials and related problems. Mechanics, especially statics, is of fundamental importance, but has not been included, partly because it is more closely related to mathematics and should be taught in conjunction with that subject, and partly because it has already been dealt with in other published works. The text is mainly a selection of material, gathered in the course of many years' experience and from many sources, of scientific principles necessary for an intelligent study of building problems in general. The importance of practical work cannot be over-emphasized, yet inexperienced students often miss the essential conclusions to be drawn from an experiment owing to their want of familiarity with scientific apparatus. With this in view, the text is intended to serve as a summary of the results obtained by the experiments. It will be evident, therefore, that the exercises should first be carried out, and the preceding text will then form a connected account of the whole. In order to economize time, many of these exercises may be performed by the lecturer as class demonstrations, individual students being called upon to assist. A section on materials is included, not as a complete treatment of the subject, but to show the

Physical Properties of Paint

The two important components of paint are the vehicle and the pigment for upon them depend the life and wearing quality of the paint.

The Vehicle

Of all paint vehicles linseed oil is recognized as the best and most suitable to withstand wear and exposure.

Even if used alone, linseed oil provides a certain amount of protection as it adheres strongly to the surfaces on which it is applied. But this film soon wears away under the elements and abrasive action of dust, etc.

To increase its wearing capacity this film is made stronger by the addition of some solid substance known as the pigment.

The Pigment

Where the preservation of metal surfaces is the main object, first consideration should be given to a pigment that aids in preserving the original elasticity or "life" of the oil.

The pigment *must* be inert—that is, it shall not undergo any chemical change in use because such a change must cause the film to become pervious and lose its protective power.

The thickness of paint films is limited. Beyond a certain thickness the paint runs, or in drying forms a tough skin

on the outer side leaving the inner portion soft. By preventing the access of air to the under parts this outer skin retards and even prevents thorough drying.

Flake Graphite as a Pigment

Flake graphite has proved, by far, to be the best pigment for metal protective paint. It is the only one of the carbon family that has the marked endurance necessary for a protective paint pigment.

It is absolutely inert and is not affected by the action of acids, alkalies or other deteriorating agents. It has the peculiar quality of "water repellancy" and as corrosion does not occur except in the presence of water or dampness, this is a strong point for its use as a pigment.

Silica is used to give the natural flake graphite still further endurance. Experience has shown that a mechanical mixture of silica and graphite is in no way equal to the natural combination as found in Dixon's Silica-Graphite Paints.



Dixon's Silica-Graphite Paints are composed of boiled linseed oil for the vehicle and natural flake graphite for the pigment with the addition of small amounts of colors for tinting. They meet the above specifications in every respect.

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application of parts of science dealt with to building.

The author, a well-known English structural engineer and a master in a widely known technical school, writes having in view present-day building in England, but there is little in his 15 chapters which is not equally applicable to building in America, and a careful study of the volume is recommended to architects, specification writers, builders, and indeed to anyone interested.

REAL ESTATE MERCHANDISING. By Albert G. Hinman and Herbert B. Dorau, Assistant Professors of Economics, Northwestern University School of Commerce; Research Associates in the Institute for Research in Land Economics and Public Utilities. With Introduction by Richard T. Ely, Director of the Institute for Research in Land Economics and Public Utilities. 363 pp. Price \$6. A. W. Shaw Co., New York.

REAL Estate Merchandising" recognizes the business which renders service to buyers and sellers of real property as a profession. The authors in their work on urban land economics in the Institute for Research in Land Economics and Public Utilities realized the need for a thorough text book for the use of both the student in colleges and universities and the real estate dealer in the field. Their efforts to create an authoritative work have been notably successful, meeting the needs of both.

In undertaking a comprehensive treatise on real estate merchandising, the authors have recognized the student's need for an analysis of the fundamental considerations which motivate the profession of real estate merchandising, and have founded their book on an almost elementary discussion of the basic factors which cause people to buy and sell realty. At the same time they have not neglected the need of the active real estate dealer for practical guidance on the many problems which arise in the actual conducting of his profession, and hence the book peculiarly combines the features of a college text book and a practical business handbook. The value of this sort of treatment to the student cannot be overestimated, for while he is acquiring a solid foundation of elementary principles he is also acquiring a working knowledge of the practical problems which he will encounter when engaged in the actual practice of real estate merchandising. The elementary nature of some parts of this book would at first sight seem unimportant to the practicing real estate dealer, but a thorough study of the entire problem, as presented in this text book, would unquestionably be of greater value, even to the experienced broker, than a glance at the first chapters might indicate. Further on in the book an active broker would find much of a highly practical value in his daily work.

The first five chapters, covering only 48 pages, discuss in considerable detail real estate merchandising as a public calling and as a profession in the making, the requisites for success in real estate merchandising, realty as a merchandising commodity, and the real estate market. There is much of significance in the latter chapter which discusses, Why do people buy realty? What people buy realty? What realty do people buy? When do people buy realty? and the contro-questions of Why do people sell realty? What people sell realty? What realty do people sell? and When do people sell realty? Here in a few pages is given the real practical background of all real estate merchandising activity. Beginning with Chapter VI on real estate business administration, the book takes up in the five ensuing chapters the practical problems of organizing and administering an active real

estate office. There is a chapter on multiple listing, and others on managing real estate, selling, selecting the salesmen and securing permanence in the sales force. The remainder of the book, beginning with Chapter XI, which is a brief analysis of the sale process, is devoted to selling and advertising methods as related to the active practice of the real estate profession. There are chapters on planning real estate advertising; selecting advertising mediums; constructing the selective appeal; writing copy and headlines; displaying the advertisement; advertising by mail; preparing the sales letter; and measuring the effectiveness of merchandising methods. Five appendices are included, giving the code of ethics of the National Association of Real Estate Boards, laws relating to the registration of real estate brokers and salesmen, and regulations concerning the multiple listing system. This logical division of the subject of real estate merchandising into its basic elements, its practical administrative problems, and successful merchandising methods, is commendable. The authors have recognized in their preliminary research work the need for translating the theory of the classroom into the practical problems of the active real estate office, and have embodied in their work a great mass of information obtained through questionnaires and interviews with many practicing brokers.

The close relation between real estate merchandising and the architectural profession suggests that this book will be of interest and value to those architects who have come to recognize the fact that their work is largely a corollary to real estate transactions. While the authors have given no special recognition to this relationship, it is definitely touched upon in the brief answer to the question, "Why do people buy realty?" People buy realty for their own use or for profit. When they buy unimproved realty for their own use, they plan to erect buildings for homes or for business purposes. When they buy realty for profit they either take improved property for its income or for re-sale, and very often for alteration and resale. People buy unimproved realty for profit with intent to erect buildings for their income from rents or for sale at a profit as well as to hold the property for re-sale without improvement at a higher price. A fair percentage of real estate transactions, therefore, are preliminary to beginning building or alteration projects. The architect who is thoroughly conversant with real estate problems may put his knowledge to excellent use through appreciating the opportunities for obtaining new business that result from the transfer of ownership of both improved and unimproved real estate.

"Real Estate Merchandising" is a most comprehensive and thorough text book on the broad field of real estate theory and practice. It has all of the characteristics of a standard reference book that will command recognition for many years, both in active real estate offices and in colleges and universities. To those who are now engaged in or plan to enter this important profession, the book will undoubtedly take precedence over all previous works on the subject. Real estate owners (present and prospective), investors, builders, and architects, will find in this work much helpful information and guidance in their contacts with real estate operations, and a new appreciation of the importance in our present-day economic structure of those who are professionally engaged in real estate merchandising in any of its many forms.



Photo. George H. Van Anda

SKELETON CONSTRUCTION, "TUDOR CITY," NEW YORK
FRED F. FRENCH CO., ARCHITECTS

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER TWO

FEBRUARY 1928



OIL BURNING FOR THE ARCHITECT

PART 1. WHAT THE OIL BURNER IS AND WHAT IT DOES

BY

P. E. FANSLER

ASSOCIATE EDITOR, THE HEATING AND VENTILATING MAGAZINE

SO frequently is the architect asked by a client for data on the use of oil fuel for domestic use, or for a specific recommendation or opinion relative to this burner or another, that it has become necessary for him to acquire accurate knowledge of this subject. So many types and so-called types of oil burners are being exploited that the architect should be able to describe to his client in simple terms the basic principles of operation, the outstanding merits of the different types, and the definite limitations of this form of heat production. It is, therefore, proposed rapidly to sketch the essentials; then to summarize the pros and cons.

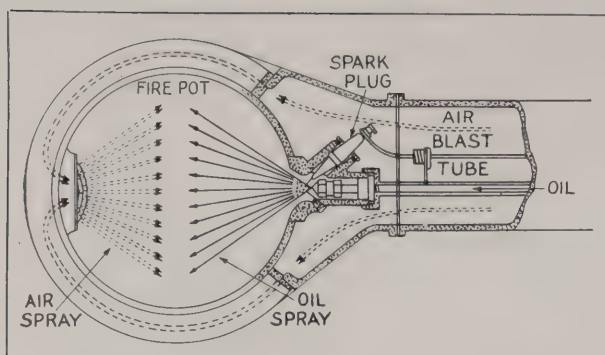
Of the houses built during 1927, it is estimated that 110,000 were constructed from plans and specifications drawn up by architects. If each of these houses had been equipped to burn oil, at an average cost of \$700, these home owners would have invested, in the aggregate, \$77,000,000,—rather a large sum to be expended on the basis of the architects' recommendation of oil burners. As a matter of fact there were installed, during 1926, by 26 leading manufacturers, 77,000 burners, representing an aggregate cost of \$64,000,000, and the business of 1927 probably was not far from 140,000 burners, worth \$115,000,000. It is impossible to determine what proportion of the burners marketed last year was installed in new houses, but there is evidence that the architect is an important factor in this comparatively new field of endeavor.

This summary does not take into account the simple and cheap atmospheric burners, directly gasifying the oil, and depending upon chimney draft for the air supply. Some burners of this type are really remarkable little devices. They burn light oils with comparatively high efficiency. They frankly are for the man of small means; require periodical cleaning; usually are manually controlled, and are not suited to anything but smaller houses. Many of these devices, however, are little more than smudge-pots, and are manufactured and marketed by men with little or no knowledge of the science of oil combustion; they consist of a few rough or semi-finished castings, and are sold for cash,

with no thought of service or possibility of come-back. The atmospheric burner has had its genesis and its greatest distribution throughout the oil-producing section of the southwest, where oil is cheap and where not infrequently the home owner burns oil from his own well. It is not an important factor, outside of the oil-producing areas, and is seldom considered by an architect.

The Modern Automatic Mechanical-draft Burner. The domestic oil-burner type of today uses an electric motor varying from 1/10 to 1/4 h. p., to drive a blower or fan which furnishes air for combustion at a definite rate. Usually the motor also drives a pump that draws oil from the storage tank and delivers it to the burner at a rate that gives the best heat-transfer results with the boiler or furnace in which the burner is installed. One mark of a first class burner is its ability to control accurately the flow of oil and air in an unvarying ratio, exactly as determined by the expert who adjusts the burner when it has been installed. The typical burner of the present time is characterized by intermittent operation; perhaps, from the standpoint of the home owner, it is more to be desired than the constantly functioning burner, although, with all its super-human automatic starting and stopping, under the guidance of a thermostat located in a distant part of the house, it is a moot question whether it is the more desirable from a technical standpoint.

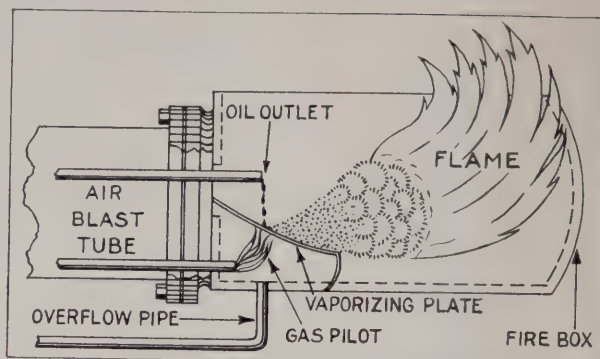
Every Oil-burner Installation a Problem in Heating Engineering. One of the greatest mistakes that have characterized the merchandising plans of more than one manufacturer has been the belief that selling oil burners is just like selling anything else,—merely merchandising a commodity. The truth of the matter is that heating plants in homes, office buildings, hotels and schools should be, and nearly always are, engineering projects. Consequently, the installation of a highly specialized device for burning liquid fuel adds an engineering problem that must be worked out on the basis of what has already been designed and put in. An appreciation of this fact must precede oil-burner development, as trouble invariably will follow its disregard. An



Fire Pot Type of Burner in Which Air Blast and Oil Blast Enter the Fire Pot from Opposite Sides

oil burner certainly cannot be considered adapted to any and every heating plant; neither can it be hailed as a panacea for sick heating plants that have not given satisfaction. It is probable that no small portion of the sales resistance that has been encountered in the past has been due to over-enthusiasm on the part of agents, nearly all selling on a commission basis, and eager to promise anything to get the signature on the dotted line.

First Principles of Oil Combustion. In the first place, the so-called oil burner does not literally burn oil, as such, at all. Oil sold for domestic heating, like gasolene, is a hydrocarbon, derived from crude oil by the process of distillation, and it will not burn until changed into gaseous form and mixed with air. The carburetor of an automobile performs this function of gasification by drawing air through or over gasolene. The oils used for domestic fuels are much more difficult to change into gas, and frequently require heroic treatment. Consequently, the oil burner is, first of all, a mechanism for converting liquid hydrocarbon into gaseous hydrocarbon. This gaseous hydrocarbon differs, in one essential, from the manufactured gas that is so rapidly developing as a house-heating fuel,—it

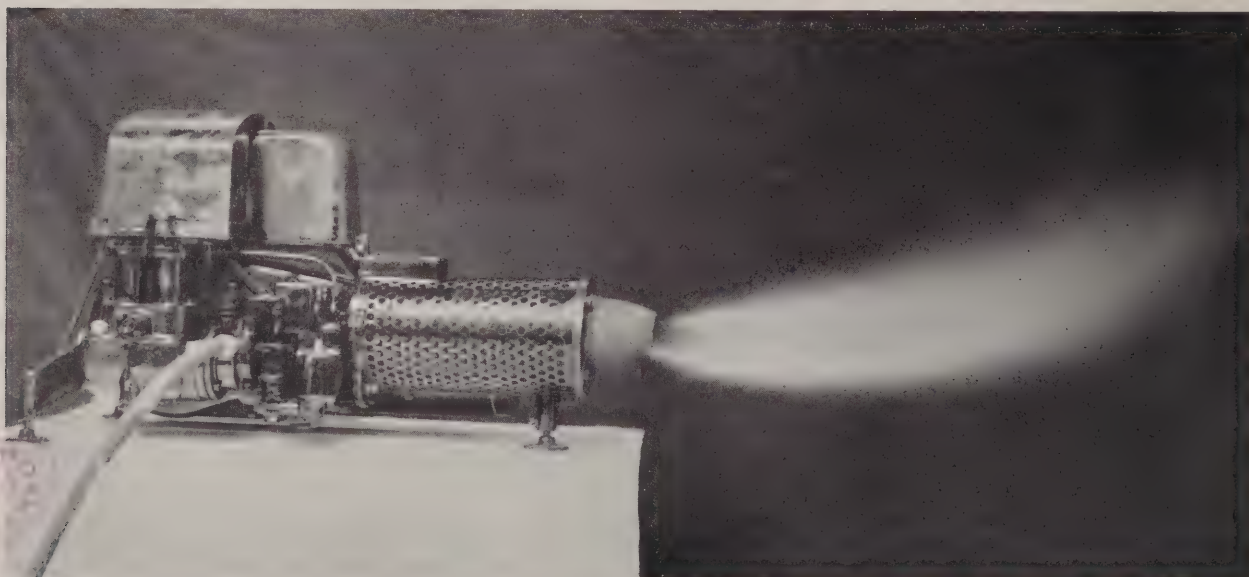


Vaporizing Pot Type in Which Oil is Directly Gasified on Drip from the Open End of a Pipe

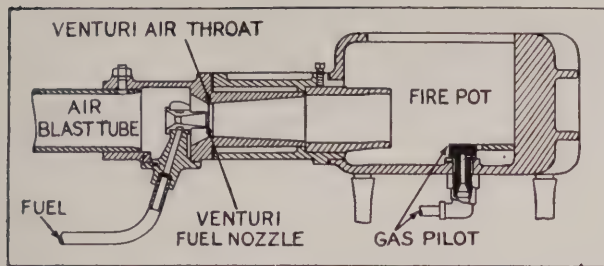
is not "stable" at ordinary temperatures, and unless maintained in a heated state quickly reverts to liquid form. So it must be made only at the rate at which it is required. In the intermittent type of burner the mechanism is dormant as long as the temperature in the house remains above the point at which the thermostat is set. When the house cools one or two degrees below that point, the operation of the thermostat causes the burner to begin to make oil-gas at a definite and predetermined rate, and to ignite this gas in the combustion chamber or firepot of the boiler or furnace.

The rate of combustion usually is such that the boiler operates at or near its point of highest efficiency. When sufficient heat has been developed to bring the temperature in the building back to one or two degrees above the desired point, the thermostat again acts, this time to stop the production of gas; consequently, the production of heat halts until the temperature again drops. So the burner "floats" intermittently, producing heat to match the more or less steady loss of heat from the building.

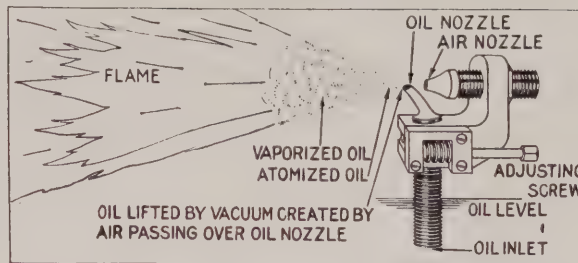
Gas-making and Combustion Are Automatically Initiated. There are, then, two essential functions of this type of burner,—the production of a gas-



A Burner in Which Combustion is Initiated and Practically Completed in a Combustion Tube



A Fire Pot Type in Which the Oil is Atomized in the Throat of a Venturi Nozzle



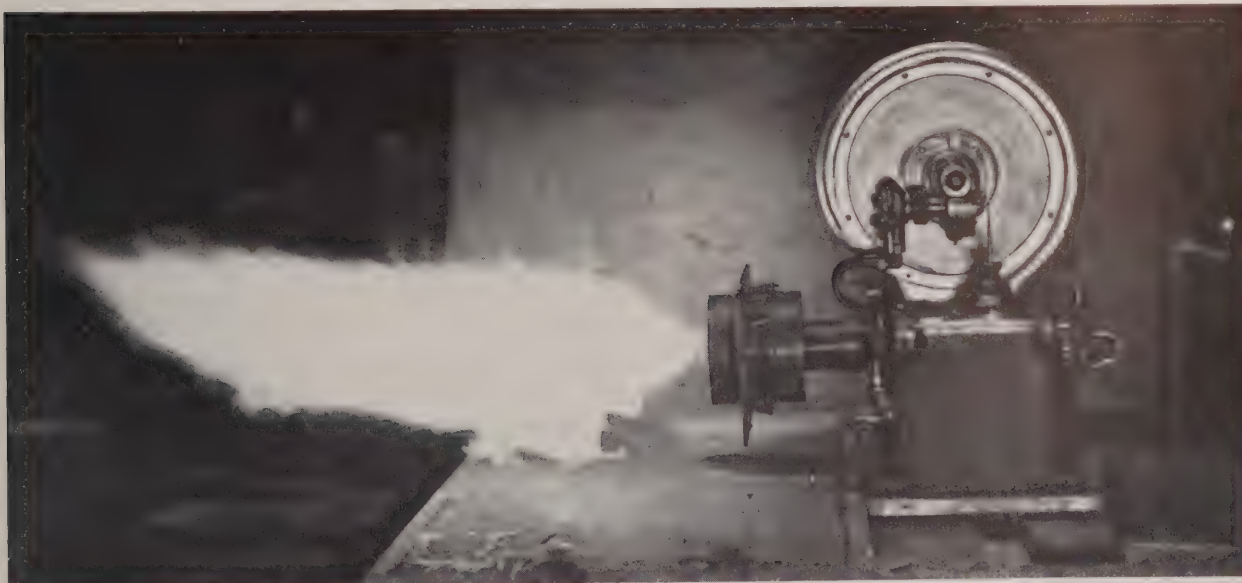
Atomizing Device Similar to Dressing Table Atomizer in Principle

air mixture, and its automatic ignition. Now there is only one way that oil can be changed into gas, and that is through heating it. Atomizing the oil or breaking it up into minute globules is merely a preparatory step, vastly increasing the surface of a given quantity of oil. This increased surface allows heat to act more quickly on a given volume of oil than if it were in a single large sphere, or in a sheet, or even spread out in a thin film. When a burner of this type starts, ignition is accomplished through a hot electric spark or a gas-pilot flame. The heat from either of these gasifies the oil globules close to the point of ignition, and combustion almost instantaneously spreads through the entire jet of atomized oil. The radiant heat from the flame quickly heats the refractory lining of the combustion chamber, in whatever form it exists, and this heat is reflected back and performs a useful and necessary function in speeding up the gasification of the oil globules. It is highly important that none of these tiny drops of oil strike any part of the boiler walls, as they would quickly build up a film of soot, and soot is a most excellent insulator which would soon reduce the efficiency of the boiler as a heat-transfer device.

Air and Oil-gas Proportions Should be Definite. It is obvious that a prime function of the burner

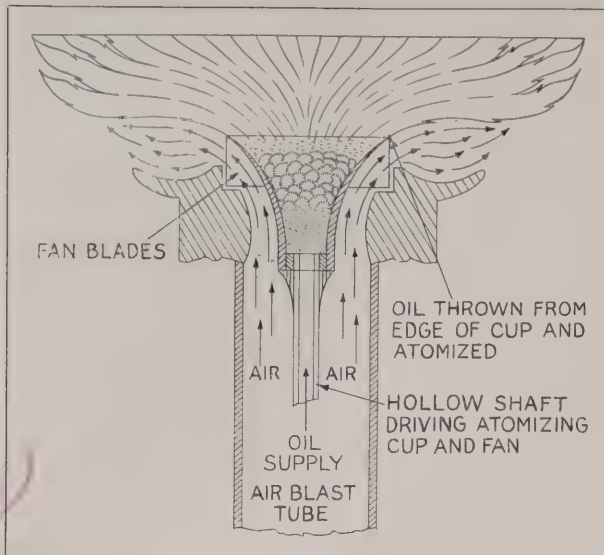
mechanism is to cause a definite amount of air to be introduced to the combustion chamber and there intimately mixed with the oil-gas. It is impossible for a burner to produce complete combustion if exactly the theoretically correct amount of air is admitted; there must be an excess over the theoretical amount required, but as was aptly said, "there must not be a *surplus* of excess air." Between 25 and 50 per cent excess air will be needed with most burners, although as much as 100 per cent must be used with burners of poor design. The metering devices, then, must be extremely accurate in measuring the amounts of air and of oil fed to the burner. When the burner is installed the setting should be made only on the basis of flue-gas analysis made with an Orsat apparatus. This will indicate the degree of combustion efficiency obtained, and the burner, once set at the optimum point, should not be disturbed. It is a pretty safe gamble that any manufacturer, or his representative, who insists on making an examination of the heating plant before definitely signing up for the burner, and who checks the efficiency of his burner by an actual flue-gas analysis, can be relied upon to deliver a satisfactory equipment.

Vital Features of Leading Burner Types. There are so many types and styles of burners that it

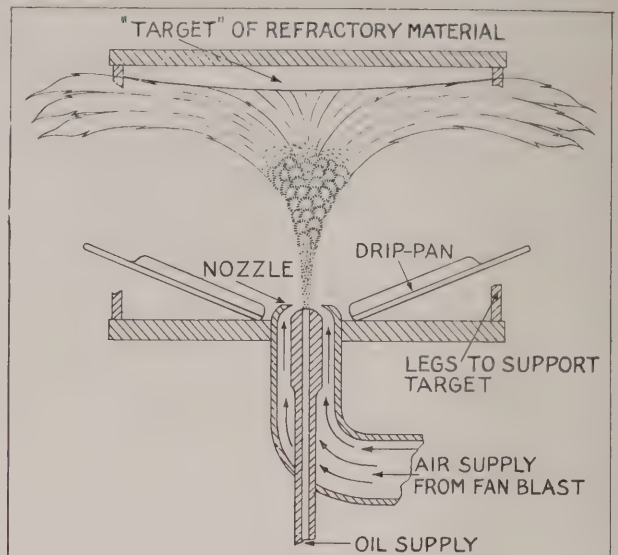


"Gun" Type Burner, Atomizing Oil by Throwing It from the Edge of a Rapidly Revolving Cup

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Oil is Atomized by Being Thrown from the Edge of the Vertical Chalice-Like Cup Which is Rapidly Rotated

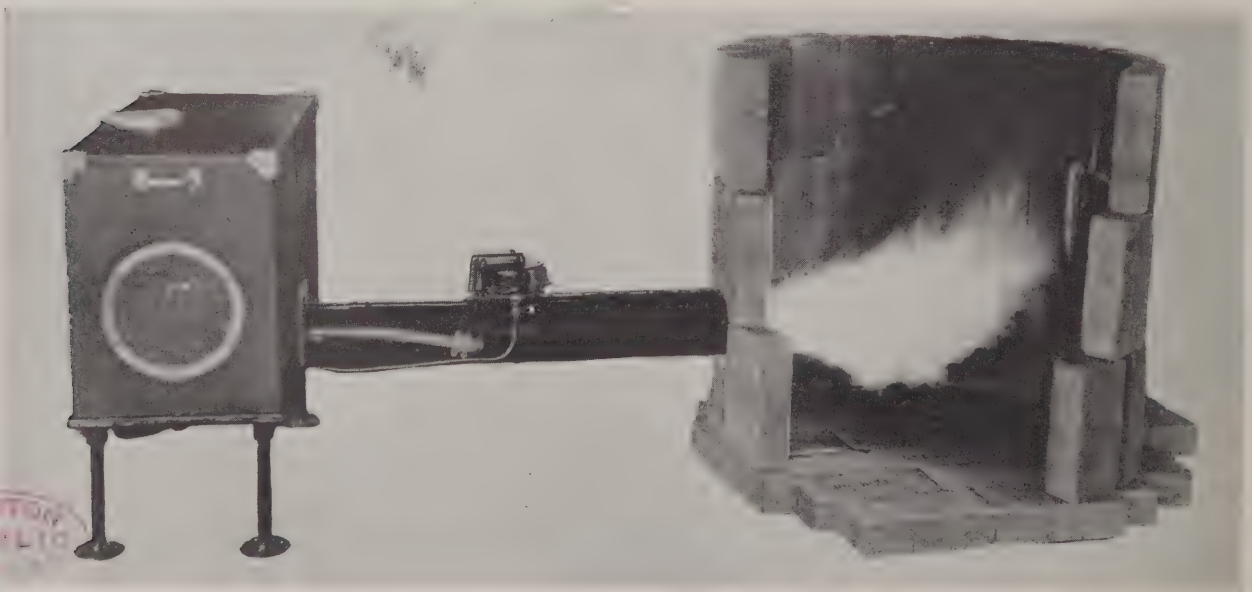


Oil is Atomized by a Nozzle, and the Flame is Directed Against a Refractory Target Above

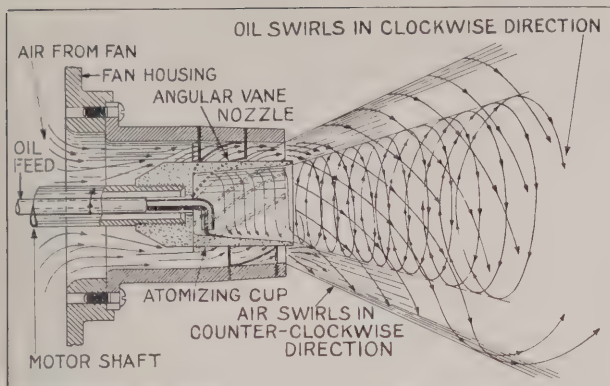
is practically impossible to classify them in any completely satisfactory way; suffice it to mention the more important, and comment on their salient features. Two of the earliest types, dating back at least a quarter of a century, are "the rotating cup atomizer" and the "nozzle atomizer" using compressed air to break up the oil. The latter type followed the burners developed for navy use, but were better adapted to larger units than were required for domestic heating. The use of the rotating cup at the end of a horizontal shaft, atomizing oil by feeding it to the inside of the cup and throwing it from the sharp edge by centrifugal force, had its genesis on the Pacific coast, and had extended use long before oil was used as a domestic fuel east of the Mississippi River. This type has long been so well developed that at a recent exhibition of burners one manufacturer showed a

1917 model beside another of the 1927 vintage, and only careful examination of details showed any change. This type of burner has one distinct advantage in that it can be used with almost any fuel oil that can be burned. It produces a conically-shaped flame that can be flared, when installed in a wide firebox, and lengthened, when set in a long and deep boiler. One manufacturer ships from California to an eastern distributor by way of the Panama Canal. The tiny burners destined for Long Island homes are carried in steamers that are fired with huge burners of the same make.

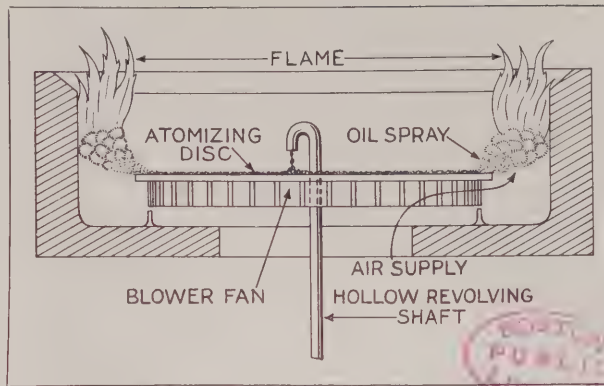
A later development of this type of burner provides for a vertical revolving cup set in the center of the chamber, at the grate level, and driven by a motor set outside of the boiler, the drive being through spiral gears. The cup, in this case, has a wide, flaring mouth, so that the oil is thrown



A Burner Typical of Several Makes, Atomizing Oil at One End of a Blast Tube



Oil Thrown from a Revolving Horizontal Cup Mixes with Counter-Revolving Air. This Produces a Flame Similar to that Shown at Bottom of Page 252



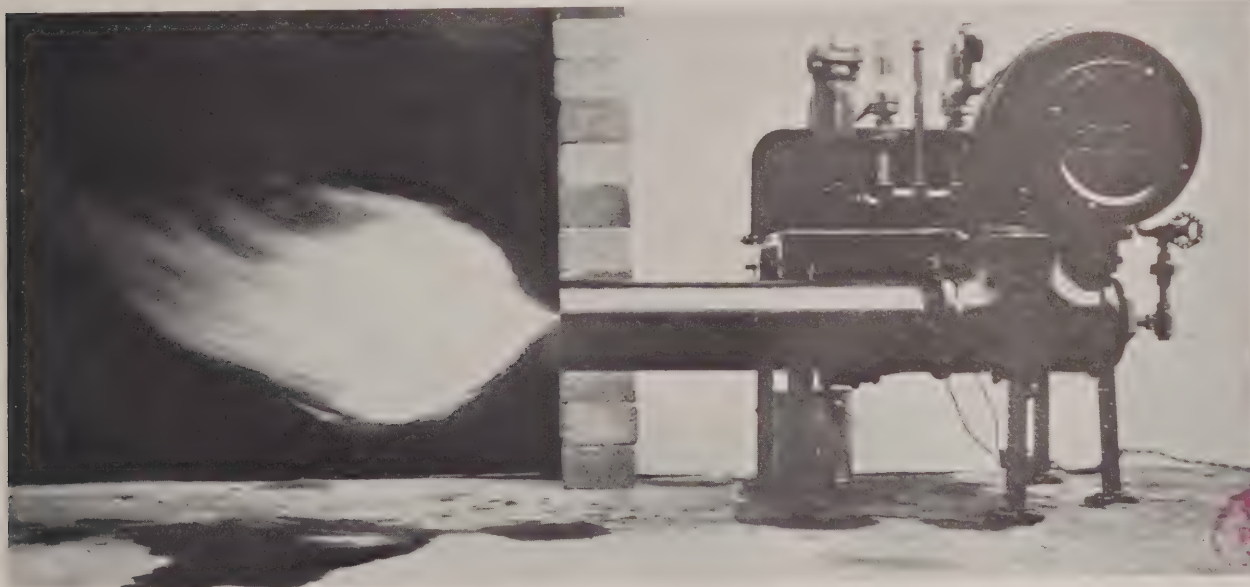
Oil Carried Through a Vertical Shaft is Delivered to a Revolving Horizontal Disc and Gasified by the Radiant Heat from the Surrounding Refractories

in an almost horizontal sheet. Another design flattens the cup to a revolving disc driven in the same manner and handling the oil in the same way. Several small burners use modified discs or cups, but the drive is direct from a motor placed vertically in the ashpit.

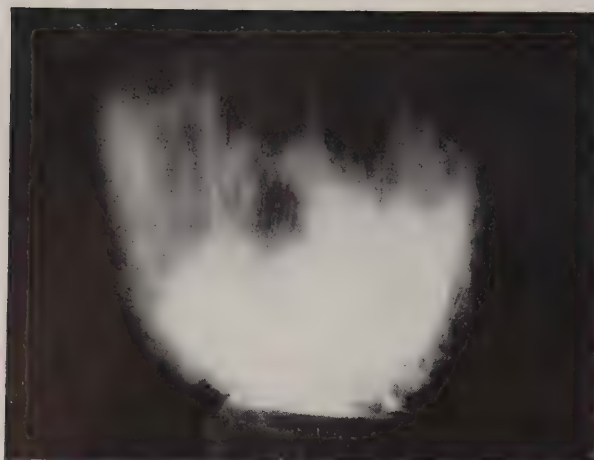
The "Gun" Type. Then there is the "gun" type burner, in which an air blast is carried in a horizontal tube set with its end projecting into the lower part of the boiler, usually through the ash-door frame. In this tube is a rotating cup driven by a set of vanes on its outer surface, against which the air blast acts. Oil is fed into the cup through a hollow shaft, and is atomized by being thrown from its periphery. Again, this type follows the huge burners developed to use heavy oils in large boilers. Another well developed burner utilizes the simple principle of the dressing table atomizer. A small vertical tube is set with its lower end dipping into a sump containing oil maintained at a fixed level. The air blast directed across the upper end of the tube draws oil from the sump and atomizes it by the force of the blast.

Developed for the Steam Car,—Now Leading Domestic Burners. Distinctive types of burners for domestic heating were the offspring of burners first developed for use in steam automobiles. These were the first types to be automatically started by a thermostat, and the idea of dispensing with manual attention and having the burner started through the action of the thermostat, and intermittent in operation, has generally been "sold" to the American public. From one of these types has sprung the "combustion-pot" burner, in which combustion is initiated and partially completed in a metallic pot, sometimes lined with refractory material, the pot taking the place of the bricked-in combustion chamber. Yet another type of burner brings about atomization by forcing the oil through a small orifice, or by drawing it through the throat of a Venturi tube,—a passage having a restricted section forming a neck. The ingenuity of American engineers has produced an almost incredible number of modifications of the various essentials of burner design.

The Controls Are Really Super-human. Probably the most fascinating phase of oil-burner his-



A Blast Tube Burner Made up Largely of Usual Commercial Fittings and Parts



The Extended Flame of a Pot Type Burner Using Flue Gases to Slow Down and Quiet Combustion



Flame Produced by an "Atomizer Type" of Burner Similar to that Shown in One of the Diagrams on Page 251

tory has been the development of the controls by which the burner's functioning is governed. Assume that it is required to start a burner, where a small gas flame is maintained as a pilot, and where this flame is expanded to produce a large hot flame that will insure ignition. Oil is to be atomized by forcing it through a hole in a nozzle. Also it is desired to safeguard the operation, so that if for any reason ignition is not accomplished, the burner will not continue in operation, squirting raw oil into the combustion chamber. A tiny electric motor drives, through a train of gears, a slowly revolving plate of bakelite, into which are moulded circular arcs of copper. Bronze fingers rest on the disc in such a way as to complete electrical circuits through the metallic portions. The living room, in which the thermostat is located, grows colder than the temperature at which the thermostat is set. The contraction of the thermostatic element closes the circuit to the little motor, and it starts rotating the slowly moving disc. A finger makes a contact, and the burner motor starts, building up air pressure with the blower and oil pressure with the oil pump. At the same instant another circuit is closed, opening a magnetic gas valve and causing the small pilot flame to expand. By this time the oil pressure has built up to the required degree, and the oil nozzle opens. The atomized oil is blown into the gas flame, gasified by its heat, and the combustion reaction between the oil-gas and the air from the blower is initiated. When sufficient time has elapsed to provide for the ignition, the gas valve is automatically closed and the gas flame dies down to a minute pilot, consuming very little gas. Suppose, however, that combustion had not been brought about, possibly because the gas pilot had been extinguished or because the gas supply had been cut off. An interlocking control is located in the stack, and unless this is heated to a definite minimum temperature in a definite number of seconds after the burner motor starts, it acts to shut down the entire burner, and it cannot again be started until

the trouble has been remedied, thus insuring safety.

Of course this control device must go through a definite cycle; each operation must be in its proper order and with definite timing. Therefore, human ability has been transcended in its design, and if something should happen to stop the control device before it has completed its cycle for starting the burner, such as an interruption to the electric service, the control on the resumption of service would immediately move to the starting point of the cycle and go through a complete program to put the burner in operation properly.

Protection Against Human Error. Again, there has been provided a safeguard against the home owner who likes to "air out" the house. If the windows of the room in which the thermostat is located are left open for any length of time, the thermostat will start the burner, and it will continue to generate heat in the boiler with no chance of the thermostat's shutting off the burner, because the room cannot be warmed up with the windows open. Under such conditions it might easily be possible for the burner to generate enough heat to lower the water line in the boiler and cause serious damage. But a little safety device, located just inside of the boiler wall, is interlocked with the burner control, so that as soon as the water or steam rises to a definite temperature, the burner is shut off, regardless of the fact that the thermostat may be calling for heat. In this way the owner of a burner is protected even from his own carelessness, and it is no wonder that with such operation and control, the use of fluid fuels is rapidly spreading throughout the United States.

The April issue of THE ARCHITECTURAL FORUM will set forth in detail the usual clients' questions, and will give specific information on which the architect may rely in giving answers to his clients, who so often depend entirely on his counsel in the matter.

Editor's Note. Diagrammatic illustrations used through the courtesy of Good Housekeeping Institute.

THE DEEPEST FOUNDATIONS

BY

FRANK W. SKINNER
CONSULTING ENGINEER

THE efficiency of the great industrial furnaces now in use made possible column loads that necessitated footings below a deep stratum of treacherous clay underlying the Cleveland Union Terminal Building. The tallest of subterranean piers were built there in open wells safely excavated far beyond previous foundation limits notwithstanding increasing dangers of crushing, flooding, fire and explosion, 260 feet below the surface. Not until about the beginning of the present century were there devel-

oped the great furnaces that can properly heat huge steel ingots. Not until these great 10-ton castings could be heated almost white-hot was there perfected the structural steel that alone makes possible the metropolitan skyscraper. Not until buildings towered to heights of from 20 to 50 stories did their column loads produce such enormous concentrations of weight on the foundation piers that nothing short of solid rock bearings is satisfactory footing for them.

In the public square in Cleveland, where the



Cleveland Union Station

Graham, Anderson, Probst & White, Architects

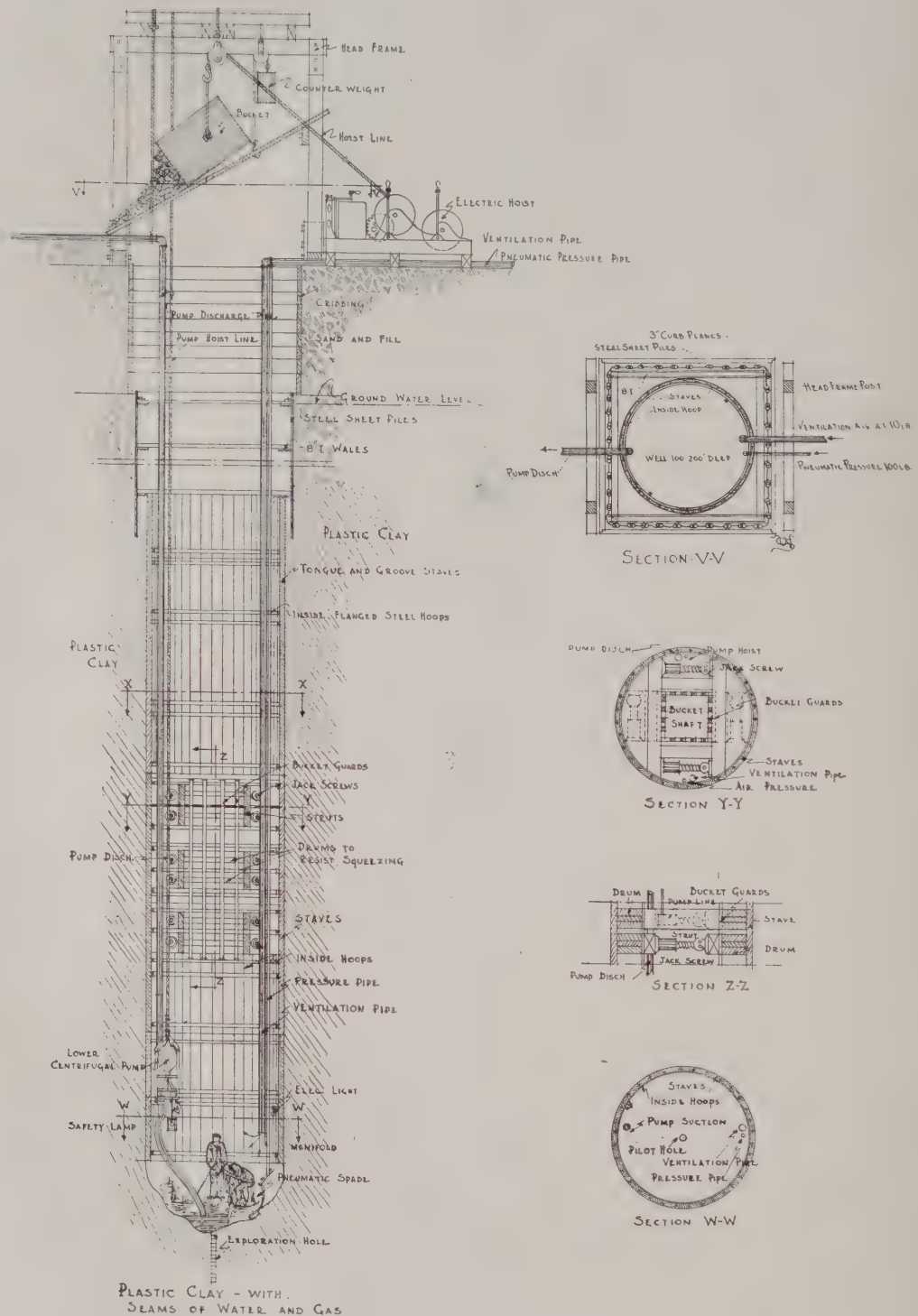


DIAGRAM SHOWING METHOD OF SINKING THE DEEPEST FOUNDATIONS
CLEVELAND UNION STATION
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

\$11,000,000, 52-story Union Terminal Building rises to a height of 708 feet above the street, bedrock is more than 250 feet below the surface, and to carry the foundation to it there was required much deeper excavating than has ever been done for building foundations,—deeper indeed than the deepest of open dredged caissons, more than the penetration of the longest piles that have determined previous maximums, and far deeper than the utmost limits of pneumatic caisson work below water levels which have measured, in millions of dollars, the cost of many of the great New York buildings, where it was necessary to pass through no more dangerous quicksand to reach the rock only 100 feet below the earth's surface. The conditions were somewhat similar to those in Chicago, but far more difficult and dangerous in that the required depth in Chicago is much less, and the deadly methane gas is not encountered. The safe, rapid, and economical construction of the 87 main foundation piers of the Union Terminal Building is therefore an achievement of the first magnitude, of high importance to the architectural profession, that was accomplished by the vision and courage of the designer, supplemented by the ability of the builders and the skillful use of the best standard methods and equipment, all ably coördinated.

The great building, facing two sides of the public square and covering a 260 by 300-foot irregular area of more than 71,000 square feet, provides 560,000 square feet of rentable floor space in its 120 by 120-foot tower and in the remainder of the structure extending two stories below street level. Its 17,000-ton steel superstructure is supported on 87 very deep and slender concrete piers from 4 to 10½ feet in diameter that extend to a maximum depth of 210 feet below the bottom of the general excavation, itself 52 feet deep. The excavation to subgrade of the great basement pit, drained to half-mile ditch by four pumps that with their motors were movable on small trucks, required the removal of many thousand yards of earth, handled by steam shovels that later were used to load the 20,000 yards of muck from the deep foundation pits and to handle the steam hammers with which hundreds of tons of sheet piles were driven to line the upper parts of these pits.

When the excavation reached the surface of the great bed of water- and gas-bearing plastic clay, a particularly highly developed system of excavation was adopted; numerous small but powerful and rapidly working spades cut away the tough clay, leaving the smooth vertical sides of the circular wells, which were immediately covered with 4- and 6-foot vertical tongue and groove wooden staves forming short, complete cylindrical sections held in place by inside top and bottom steel rings. Section after section of this lining was built, from the top downward, as the excavating progressed, and after the clay had been exposed to the atmosphere it gradually began to swell, exerting sometimes such a powerful squeeze that it was necessary to brace the sides of the wells with many adjustable horizontal diaphragms having

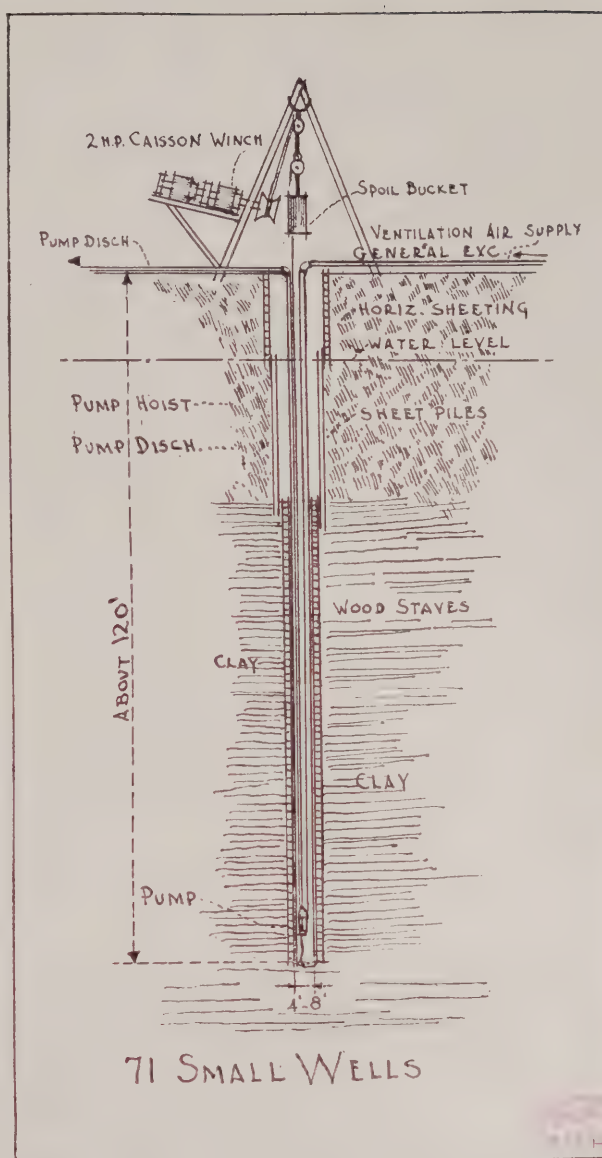


Diagram Showing the Method of Sinking the Small Wells

pairs of powerful jackscrews frequently operated to maintain the required diameters of the shafts.

Great quantities of water, flowing through seams in the clay, threatened to drown out the workmen, and were removed by powerful centrifugal pumps which, mounted with their 16-horse power electric motors in narrow frames, were suspended in the wells and were capable of delivering 200 gallons per minute to a height of more than 100 feet. At depths of more than 100 feet the first pump remained stationary while a duplicate was lowered successively to the bottom of the well and discharged into its section pipe so that the upper pump acted as a booster and was able to deliver to the bottom of the general excavation, where its discharge was disposed of to a drainage ditch. The 20,000 yards of muck, excavated by the handful, was hoisted from the wells in cylindrical buckets operated by 26 electrical hoists of from 2 to 20 horse power, raising it at a speed

of from 100 to 130 feet per minute, the same muck buckets serving for the ordinary ascent and descent of from one to four workmen in each well.

Most insidious and dangerous of all the difficulties encountered was the heavy flow of methane gas that entered the wells at a depth of 190 feet or more below the surface and which, although colorless, odorless and tasteless, was detected both by observation of its bubbles, rising through water that filled the 3-inch pilot holes driven in advance of the general excavation, and by the action of the safety lamps that flickered when a very small quantity of the gas was present and that were automatically extinguished before it accumulated sufficiently to be dangerous. This gas, which is poisonous, inflammable and explosive, has for many years been encountered in the same stratum in Cleveland, where on former occasions it has cost many lives. The contractors were therefore forewarned and safely disposed of the gas by the installation of a 1000-foot blower that poured large quantities of pure air at 10-pound pressure into the bottoms of the wells, thus diluting and sweeping out the gas, an operation that was supplemented by the exhaust of high-pressure air from the pneumatic spades and by the almost continual motion of the large buckets passing up and down in the narrow wells. Notwithstanding all of these precautions, even after the gas had been removed from one of the wells, the quantity was so great that before it was dissipated in the general excavation it was ignited by an accidental spark and burned a number of workmen.

The smallest wells were carried to a depth of about only 100 feet, where they terminated in a hard stratum of the clay; 16 of the largest wells were carried down to bedrock, which was dressed down to a depth of 8 or 10 feet to prove its soundness and thickness. When satisfactory bottom was reached, the wells were fixed with solid masses of concrete mixed at a maximum rate of 750 yards per 24-hour day in a machine operated by an engine and discharging 1-yard batches of concrete to the distributing system, which consisted of a 240-foot steel tower in which the concrete bucket was hoisted and delivered to several hundred feet of steel chutes, supported on counter-weighted suspended trusses, and hung from a high line cable. This flexible system, commanding every part of the general excavation, delivered not only to all of the wells but also to the forms for the massive concrete retaining wall that protected the high sides of the pit.

Notwithstanding the installation of the abundant mechanical equipment, the experienced subway and foundation builders of New York who were the contractors for the substructure employed a force of about 250 men that, most of them working continuously in three 7½-hour shifts per day, completed these foundations and also some minor foundations, constructed with 54 steel piles, 16 inches in diameter and from 20 to 30 feet deep, in about nine months at a cost of \$500,000, which compares favorably with the cost of many foundations of not one-half this depth, an achievement of no mean size.



Square and Tripod Head Frames Over Many Wells for the Foundations

CONCEALING THE RADIATOR

BY

ROBINSON V. FROST, C.E.

FROM the first there has been a persistent effort to get radiators out of sight. The radiator has never been able to supersede the fireplace or even the parlor stove as a focal point for the home circle, for as yet we have been unable to invest it with a personality; hence, while we recognize its usefulness we cannot accept it on that ground as a member of the family circle. Likewise it has failed to gain acceptance as an article of furniture, or even as a part of the decorative treatment. As the latter it has most insistently demanded recognition,—first as an ornate piece of art, highly embellished with supposedly artistic designs, and then, as the manufacturers recognized the trend of public sentiment, with the lines simplified, until today we have the slender tube type of radiator in which the straight line and plain surface are emphasized. Notwithstanding the appearance of the more clean-cut and dignified design that more easily harmonizes with its surroundings, the practice of concealing the radiator has grown with such strides that today the development of the concealed type of radiator is looked upon as the next step in the progress of the science of heating.

While the concealed type of radiator is rapidly becoming important, we cannot speak of it as having “arrived” commercially, for the development of those types of radiators designed specially for concealment is in a state of flux, and the sale of such radiators is still but a small part of the total production. The other phases of concealed radiator practice, those of building in recesses or using enclosures as parts of the architectural treatment for the partial or complete concealment of the cast iron type of radiator, have grown with enormous strides. To this

practice may be attributed not only the rapidly growing development of the type of radiator designed especially for concealment, but also the development of the portable type of enclosure or cabinet now sold by furniture, hardware and department stores. But probably the greatest increase is in the number of radiators that are enclosed as parts of the building construction. One hardly realizes the demand that exists at the present time for this type of enclosure. The only indication that we have of the extent of this demand is in observing the great variety and the great frequency of these installations. In the finer type of residences, in office buildings, and in public buildings of every description where architectural beauty has been featured,—churches, theaters, auditoriums, art galleries, libraries, college buildings, hotels, clubs, restaurants, stores, banks, railroad stations and the like,—one can see every day installations of direct cast iron radiators concealed in built-in enclosures.

Of course these installations are made where first cost is not the primary consideration and where there is a demand for beauty and harmony rather than for bare utilitarian requirement, for one who conceals the radiators faces not only the additional cost of enclosure, which is frequently higher than the cost of the installed radiator, but also faces the probability that he will be required to install at least 25 per cent more radiation to give the required capacity. Consequently, the concealed radiator presents a problem that requires the attention of the architect, for installations that do not require his supervision are very infrequent. The architects deserve full credit for this movement, which is now looked upon



Improving Appearance Is the Usual Motive for Concealing the Radiator



A Concealed Radiator Installation That Has Proved Efficient as Well as Sightly

Harry Gordon McMurtrie, Architect

as likely to become one of revolutionary character to the entire heating industry, for it was they who first voiced the demand for concealment of the radiator, and it is they who have continued to insist upon it.

"Condensation" and "Heating Effect." Until recent years it had generally been assumed that the performance of a radiator was entirely dependent upon the rate of condensation, and that the measurement of condensation formed a complete index of the rate of heat transfer. Now we know that there are other factors that have a most important bearing upon the rate of heat transfer or, more properly speaking, upon the "heating effect" of the radiator. The term "heating effect" as applied to a radiator is new in heating nomenclature, it being used to distinguish between the useful heat derived from the radiator and the heat input as measured by condensation. In making this distinction there are difficulties, for at present we have no definite means of measuring this quality of heat transfer. It is this quality we have seen fit to designate as "heating effect," which may receive more attention in the heating industry. While concealing the radiator had its beginning in an endeavor to hide unsightly utility, it has grown into an important phase of the science. We have observed on numerous occasions that when a cast iron direct radiator is enclosed in a casing or cabinet of certain definite proportions, we seem to get very much more heat out of it than we do when it is exposed; but when we measured the condensation from the enclosed radiator we found that the condensation was much less than that from the same radiator when exposed without the enclosure. At first we had no reasonable explanation for this seem-

ingly impossible condition, until we began to make observations of the temperatures in the room at various heights from floor to ceiling. Then we found that whereas the temperature difference between floor and ceiling was about 15 degrees with the direct radiator, when the same radiator was enclosed it was about 5 degrees.

Properly concealed radiators may save fuel, increase comfort and improve health. It has long been a frequent complaint against radiator heating that the rooms were either underheated or overheated, but few of us realized that that impression was due very largely to our positions in the rooms, whether standing or sitting. It has always been the custom to measure the temperature of a room at a level of about 5 feet above the floor, which we call "breathing line height," and if we maintained a temperature of 70° at that level, we assumed that the room was properly heated. But how many ever took the trouble to hang a thermometer at the floor level and another at the ceiling? Would it not be a great surprise to find a temperature of 62° at the floor level and a temperature of 77° at the ceiling? This temperature difference at different levels may be the source of our ideas of overheating or underheating. A child playing on the floor may be in a temperature of 63°, while a tall man standing erect may have his head in a temperature of 72° or 73°. But when he sits down he may drop into a temperature of 67°. If you passed from a room heated at 70° into another heated to but 65°, you would have an immediate sense of discomfort, particularly with the low humidity usually existing in heated rooms in winter. Yet the condition exists in most houses heated with the ordinary radiator. The nature of the seemingly greater "heating effect" of enclosed radiators cannot be completely explained at present, but it is generally assumed that the enclosure about the radiator pro-



A Shallow Wall Cabinet Which Is Made a Part of the Decorative Treatment

duces a more rapid circulation of air over the radiator surfaces, and this action in turn induces a more thorough circulation of the air in the room, thus preventing the stratification of hot air at the ceiling that exists with the direct radiator. However, this action may be but one of several of a varied nature that have a bearing upon the result.

With the growth of the practice of concealing the radiator, new types have been designed especially for the purpose. The so-called "fin" type, of which there are now a dozen or more on the market, has many desirable features as a concealed heating unit. This type possesses a number of metal fins that add radiating surface to some form of prime surface of tubular or more intricate shape. It has as its essential feature, simplicity, lightness, compactness. While the selling price of these units is now somewhat above that of the corresponding capacity in cast iron, it may be expected to drop as selling volume increases and production costs decrease. Although the trend seems to be toward a new type of heating unit for concealed radiator installation, the usual cast iron radiator is employed with excellent results.

Principles of Enclosure Construction. If certain definite rules are followed in the construction of the enclosure, not only may the heating effect be measurably increased but there may be a marked saving in fuel as well. It is very easy in the construction of the cabinet or enclosure to nullify all the economic value to be derived from an enclosure, and there are many installations of concealed radiators that injure rather than improve the heating effect,—though they may achieve their purposes of decorative effect. The features of correct design are indicated in the diagram shown on page 262. Each of these features is important, and the alteration of any one may nullify the effect of all. Determining these features is the development of years of observation. Research ex-



The Cast Iron Radiators Are Successfully Concealed in St. Paul's Church, Chestnut Hill, Pa.

Zantzinger, Borie & Medary, Architects

tended over a period of six months and was fully reported in a paper under the title "Some Facts about Enclosed Radiation" presented before the 31st annual meeting of the American Society of Heating and Ventilating Engineers. Within the past year research on radiator enclosures has been undertaken by the Engineering Experiment Station of the University of Illinois, reported in Bulletin 169 under the title, "Effect of Enclosures on Direct Steam Radiator Performance" by Maurice K. Fahnestock, but the latter research differs from the writer's in that heating effect was not considered, only condensation from the radiator being taken into account. In this regard the research was very thorough, and it is now understood that the University has additional equipment that will enable it to study heating effect as well as condensation. In the research so far completed, the data compiled agree very closely with the writer's. The only other research of record which is of value as a check is that of Dr. Charles Brabbee, conducted while he was at the University of Berlin-Charlottenburg in about the year 1908. In Dr. Brabbee's work, like that at the University of Illinois, only condensation was considered.

A cast iron radiator concealed after the manner shown in one illustration on page 260 has many desirable features and can be used effectively except in thin walls. These principles as applied to a cast iron radiator are very well shown in the illustration just mentioned. This installation, in a club dining room, by Harry Gordon McMurtrie, architect, proved so successful that this is the most easily heated room in the building, although the ceiling height is over 20 feet and there are full height windows.

Many types of radiator enclosures are available,



The Radiator Takes Up No Floor Space in This Bedroom

varying from the simple deflector over the top of the radiator through the different types to those having humidifying pans and elaborate grilles. It has generally been thought that there should be at least 2 inches clearance between radiator and the inner surface of the enclosure, but this has been disproved, as better results are obtained by placing the inner surface of the enclosure in direct contact with the front and back of the radiator. This is particularly true in the use of the new tube type radiators with their larger clearance.

A very attractive concealed radiator installation, although not making full use of the heating surface, is illustrated from a design by Zantzinger, Borie & Medary, architects (page 261). A cast iron radiator, concealed in an enclosure, not only lends itself to more harmonious decorative treatment, but the improved economy and health derived may be considered reasons for the added expense of enclosure in any type of installation. Indeed these latter reasons may be the controlling factors by which the practice of concealing radiators will become well nigh universal. The development along these lines will probably be in producing small, light and inexpensive radiators especially for this purpose. Today, however, an architect contemplating the use of one of the new fin type radiators has several points to carefully consider before selecting any one type because of the wide variation in design and rated capacity. There is a lack of standardization, which of course prevents the use of one manufacturer's fitting in place of that of another, and therefore one particular make must be selected and pro-

vided for in the heating layout. In making this choice the architect must therefore carefully weigh the different factors of strength, durability, ease of cleaning dust from the unit, probable life, space comparisons, safe ratings, etc. To illustrate the wide variation in ratings we can make a comparison on the item of space required. Three units, designed for concealing in the wall, are each 36 inches long, approximately $3\frac{1}{2}$ inches deep, and rated for a casing 35 inches high, but variously rated at 39, 37 and 27 square feet equivalent direct radiation, two nearly 50 per cent greater than that of the other. Two others, having the dimensions mentioned but approximately 7 inches deep, are rated at 55 and 42 square feet respectively. Three other radiators designed for cabinet installations are approximately 55 inches long, 9 inches deep and 38 inches high to top of cabinet. One is rated at 55 feet, the second at 70 feet, and the third at 101 feet, while a cast iron direct radiator of the same space dimension is rated at 110 square feet. The architect, therefore, has quite a problem before him in selecting the best design for his purpose. Undoubtedly, before many years, this wide difference in ratings will have been eliminated, for the existing condition has decided disadvantages to both the house owner and the manufacturer.

Heating effect and æsthetic effect do not always go hand in hand, but the newer developments in concealing the radiator have demonstrated that they are not essentially antagonistic factors. It is possible to combine attractiveness with efficiency in the heating equipment, and great strides are now being made in this direction.

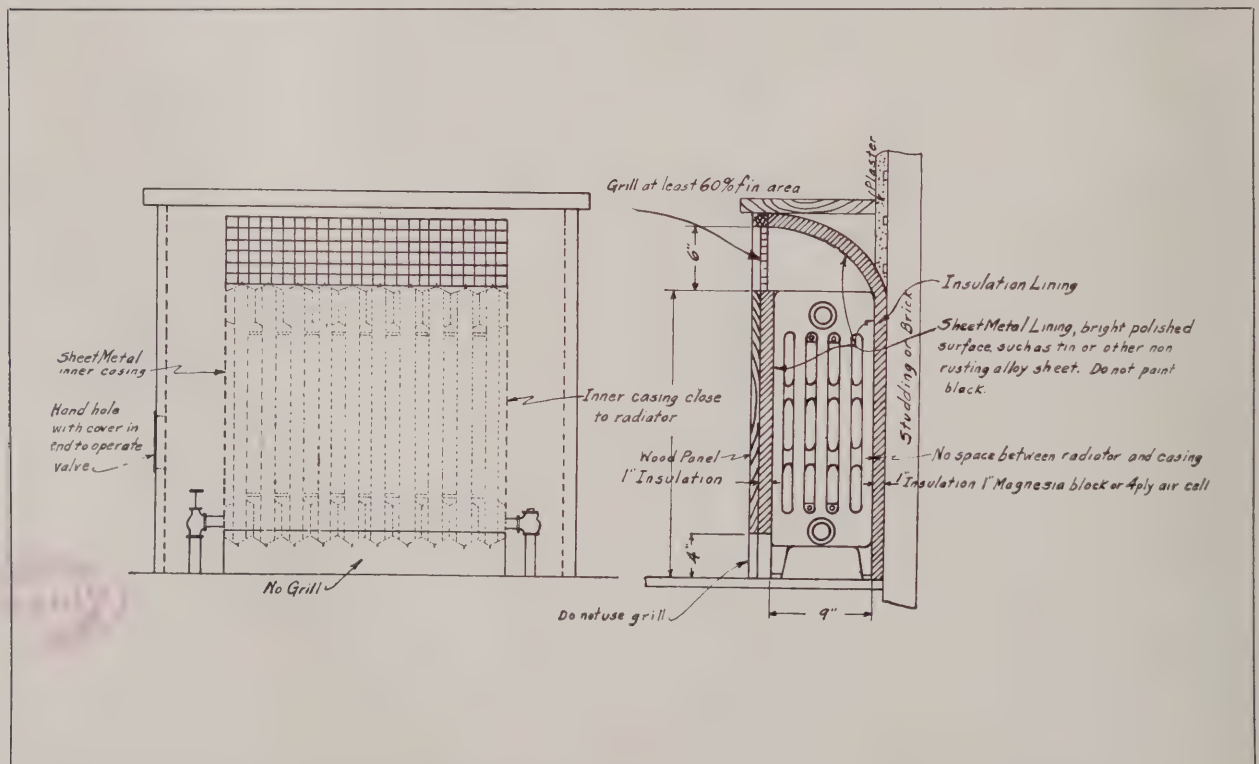


Diagram Showing the Essential Features of the Type of Radiator Enclosure Found Most Efficient in Tests Conducted by the Author

ECONOMY IN SMALL HOUSE CONSTRUCTION

BY

A. G. HILLBERG

PRESIDENT, MIDHAMPTONS HOMES CORPORATION

SPECULATIVE small house construction offers a wide field for the builder, but the architect seldom has an opportunity of aiding in this work. This might be because a builder, erecting houses as a speculation and anxious to produce them at as low a cost as possible, will create designs based on use of stock millwork, stock trim, short spans, etc., to gain his objective. He is rather afraid of the architect with his artistic tendencies that may lead to higher costs because of drawings calling for expensive or difficult work. The disastrous results of the builder's activity in the architectural field of designing are clearly shown in our suburbs, where the mass production of ugly, standardized types of houses standing side by side in symmetrical rows is altogether too common. Practically the only favorable comment that can be made about such houses is that the prices asked are surprisingly low, which is made possible only through strict standardization of every detail of the building project. Consequently, when architects do undertake the work of designing small houses for mass production, they should contrive to produce a plan offering sufficient variety in the arrangement of the rooms to permit alteration of the shape of the dwelling through rearranging standard room units without interfering with the standardization of the details of construction.

A solution of this problem can be obtained, as is shown in Fig. 1, where the living room, kitchen, and bath, forming the main unit, have been so laid out that the fireplace, boiler and kitchen flues are placed

together and are in one most economical interior chimney. Interior chimneys are obviously the cheapest. The kitchen and bathroom fixtures occupy opposite sides of the same interior partition, which reduces the plumbing system to its simplest and cheapest form. The bedrooms and an eventual dining room, all of standardized dimensions, can be grouped around such a main unit, as is shown by the dotted lines. Should an angular plan be desired, the rooms could be grouped as shown in dot and dash lines. Should more bedrooms be required, the unit indicated in Fig. 2 could be used to replace the corresponding bedroom unit shown in Fig. 1. By using floor plans such as those indicated, the shape of the house could be altered without interfering with the strict standardization of the details entering into the construction, and by placing the houses irregularly on their respective plots, the monotony could be relieved and a more pleasing appearance obtained than if a symmetrical arrangement were adopted.

When designing the shapes of the various rooms, it should be borne in mind that the floor systems must be supported in the simplest way and that it is not economical to run the joists in different directions in adjacent rooms, even if somewhat shorter spans could thus be obtained. The building should be so designed that all joists in the same floor system run parallel. Inasmuch as lumber comes in lengths which are multiples of even feet, the room dimension running parallel to the joists should also

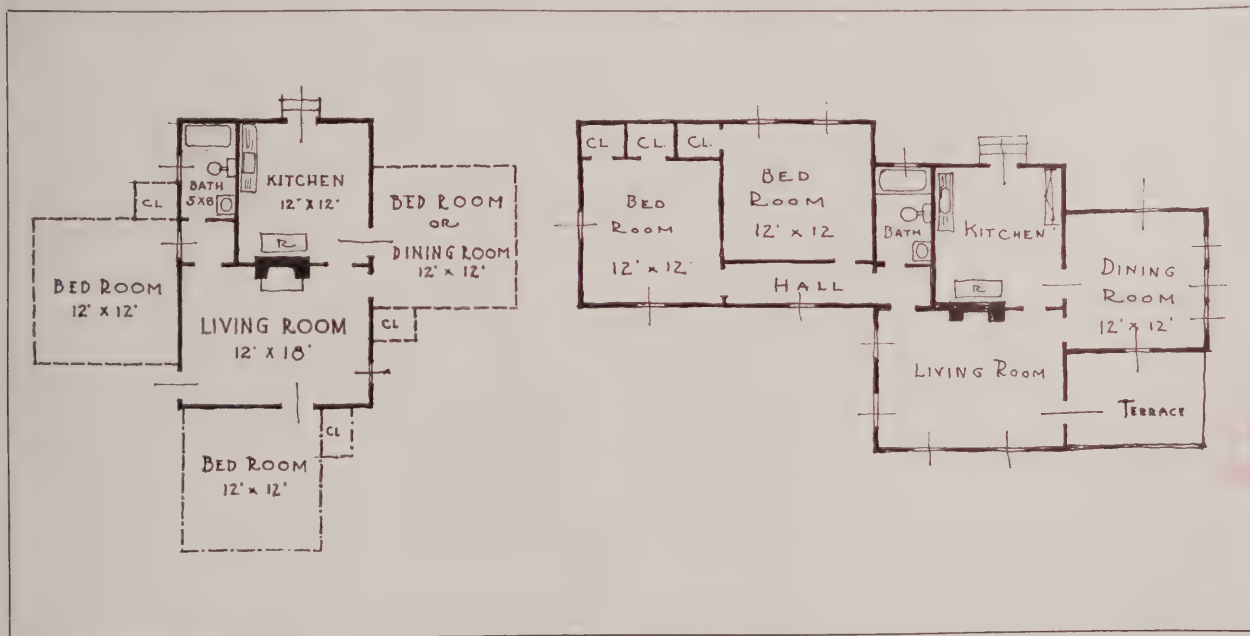


Fig. 1. Plan of Standard Units Showing Several Possible Variations

Fig. 2. Interesting Plan Developed From Same Units Shown at Left

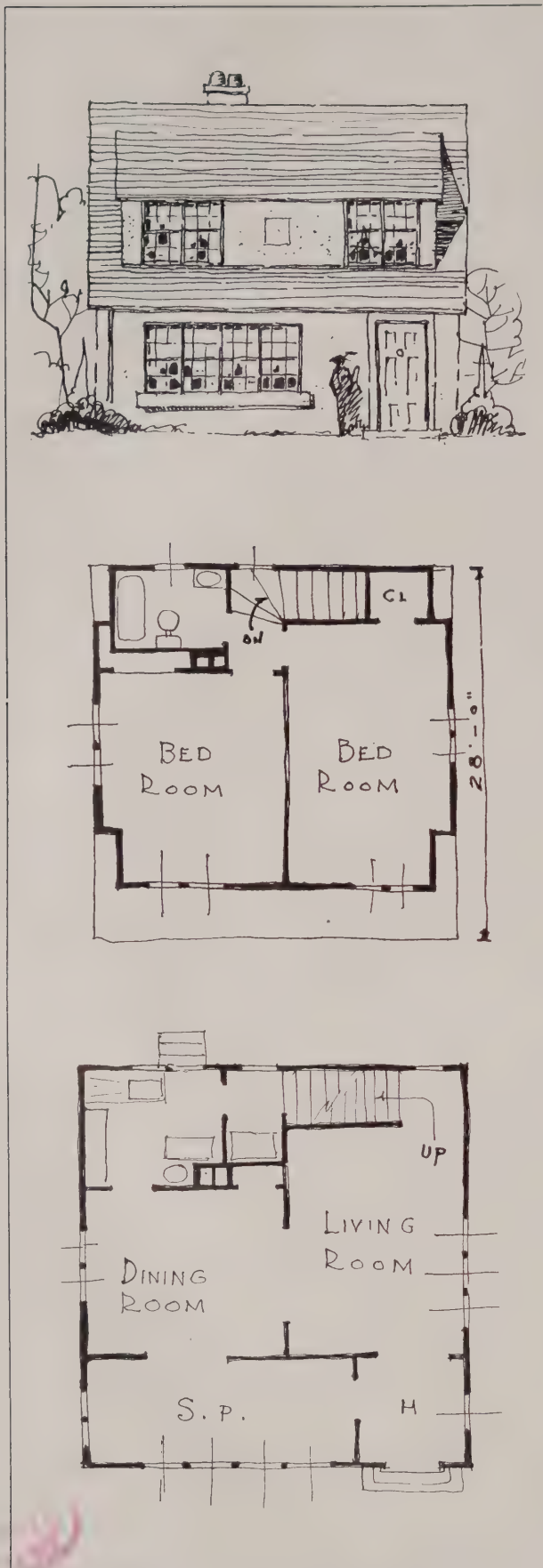


Fig. 3. An Economical Plan for Speculative Houses, Though Monotonous in the Usual Rows

be in even feet. Thus a room with dimensions of 14 feet, 6 inches or 16 feet, 6 inches should be avoided, as 16-foot and 18-foot lumber would have to be cut, and the waste per joist would be 18 inches.

As two-story houses are less expensive to build than those with all of the rooms on one floor, at least part of the dwelling should have a second story. This story need only be large enough to accommodate two bedrooms and a bath, but by having one part of the building taller than the other a more pleasing roof construction is possible. However, there could be no more economical house than that shown in Fig. 3, which is practically square in plan and two stories in height. But the difficulty of giving it a pleasing exterior treatment, and of varying it sufficiently to avoid monotony, when a large number of such houses are to be built along the same street, makes its use inadvisable except for the very cheapest type of developments.

For very small bungalows it is possible to use the four standard units as shown in Fig. 4, with two bedrooms and bath as one unit, the living room another, the kitchen a third, and a garage the final unit. Figs. 4a, 4b and 4c show how these rooms can be grouped so as to vary the exterior appearances and the interior arrangements of the bungalows.

Having considered the plan and the possibilities of securing variety and interest, even when the room units are standardized, we may turn our attention to the economies possible in the various details of construction.

Foundations. Many houses are now built without basements, but this practice is not to be recommended where houses are to be built as a speculation and for all-year occupancy. Many builders maintain that the basement sells the house and do not dare to invest their funds in houses without this feature. However, it is not necessary to have a basement extending under the entire structure. The cost of excavating the foundation can be cut materially by having a basement just large enough to accommodate the furnace, coal and wood bins, and a vegetable cellar. As a rule, a minimum of 200 square feet will suffice, and the headroom need not be over 7 feet. This, of course, eliminates the possibility of locating the laundry tubs in the basement, but washing facilities can, at a less expense, be obtained by having a combination sink and tub in the kitchen, similar to the usual apartment house practice. All foundations around unexcavated portions need to extend only to the frost limit in the ground, which varies in different localities. Usually from 2 to 2½ feet are enough. Poured concrete basement walls 7 to 8 inches in thickness are always the most economical, providing suitable concrete aggregates are to be found at or near the building site. Concrete blocks 8 x 8 x 16 inches may be used. In soil where good drainage is available, the basement floor need only be 1½ to 2 inches in thickness, made of a good grade of concrete with ¾-inch gravel or stone aggregate. In unexcavated portions care should be

taken to allow 12 to 18 inches of clearance underneath the joists to insure sufficient ventilation. Otherwise the joists and sub-floor will soon be weakened by dry rot, and in specially humid climates they may become covered with fungi.

First Floor System. If poured concrete foundations are used, it is necessary to specify a sill on which to rest the joists, as it is more difficult and expensive to mould the concrete to obtain an absolutely level bed for the joists along the entire foundation. A sill can be laid, leveled up and then grouted at less expense than trying to make the top of the concrete level (Fig. 5). When concrete blocks are used, such a sill is not required, as an experienced mason will have no trouble in laying them level. The joists can be laid directly on the blocks and held in place by an encircling frame as shown in Fig. 6. This frame holds the joists firmly at their ends and results in a saving in the bridging, as one row placed at the joist centers is usually sufficient to obtain a rigid floor system. Over door and window openings this frame is doubled to insure structural safety. A satisfactory seat for the joists can be obtained by nailing a piece of 1 x 2-inch shingle lath to the inside of the frame. It is advisable to carry the sub-floors out over this frame so as to form a complete platform on which to place walls and partitions (Fig. 7). In the first place, this method of support cuts off the basement from the open spaces in the walls, thus forming a fire stop; and secondly, it prevents the builder from nailing his studs to the sides of the joists. The latter practice is objectionable because the joists will shrink and the floor will sink down, leaving open spaces underneath the baseboard, which stays in a fixed position, being nailed to the wall. In regard to the bridging of the joists, it will be found that metal bridging as sold by various manufacturers is much cheaper and more satisfactory than that ordinarily cut from 1 x 2-inch shingle lath. No plaster ceiling need be specified for the underside of the joists if it is desired to keep the cost down, although such a ceiling of plaster on metal lath is desirable from a standpoint of fire protection.

Outer Walls. Many different treatments can be given to the outside walls, and such variation will tend to break up the monotony of a row of houses. If stucco treatment is desired, it is most economical to use galvanized wire cloth, usually welded, and manufactured with a waterproof paper backing. This material comes in standard sheets, generally 4 feet wide, which fit the usual stud spacing of 16 inches, making it possible to omit the sheathing. This reduces first cost but increases the fuel costs of the owner. It is poor economy from his point of view to omit any insulation. The scratch coat should be the customary cement mixture, and the finishing coat can be given different textures at low expense. In order to obtain various color effects, nothing is cheaper than cold water paint containing a waterproofing agency. The use of colors already mixed with the cement, which are now obtainable,

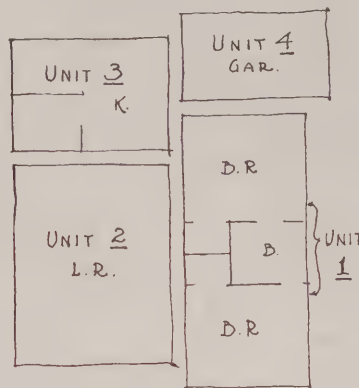


Fig. 4

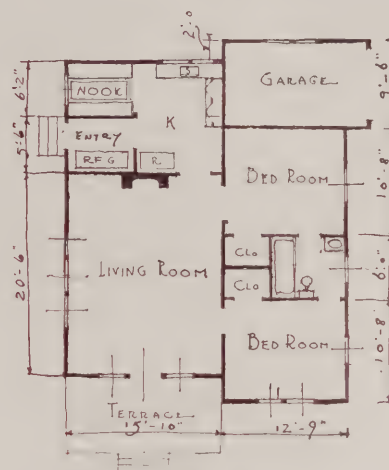


Fig. 4a

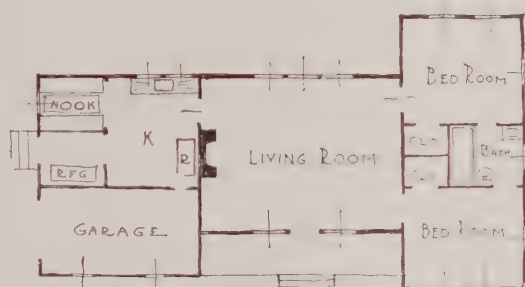


Fig. 4b

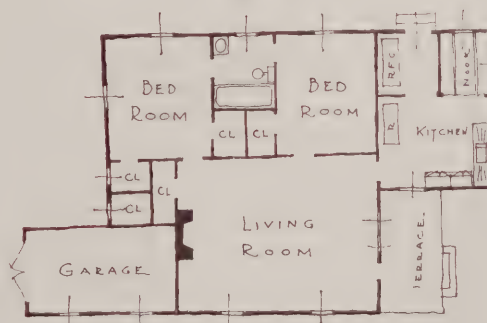


Fig. 4c

The Economical and Standardized Units of Fig. 4 Are Used in Composing the Three Other Plans

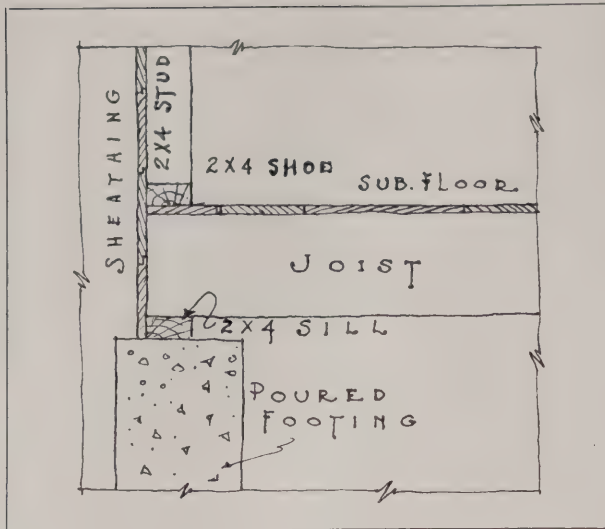


Fig. 5. Section Designed Primarily for Economy, Showing Sill

is much higher in cost, but the quality of the color is far superior to that had by the cheaper painting method. Applying stucco by machinery, that is so-called stucco or cement "guns," has been tried and no doubt can be undertaken economically in certain localities. However, in one instance, in a locality where extremely high winds prevail, this method had to be abandoned because a great amount of material from the gun was blown away before it could reach the wall. Another difficulty is also the tendency of such apparatus to provide a coating of even thickness, which may show the pattern of the wire netting.

Clapboards and shingles are also economical wall coverings, especially when the sheathing is eliminated. When shingle lath is used as a base for the shingles there is a good opportunity for bracing the corners with $\frac{7}{8}$ -inch boards and butting the shingle lath against the braces. This method is to be pre-

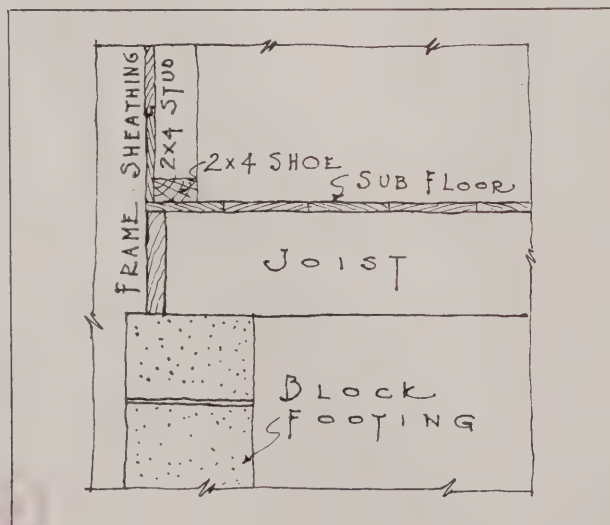


Fig. 6. Section Showing Use of Encircling Frame with Joists Resting Directly on Blocks

ferred to notching and thus weakening the studs to take the diagonal braces. With clapboards or square-edge sheathing, laid so as to overlap, a further economy can be obtained by using uprights at the corners and butting the boards against them, thus avoiding the expense of mitering the boards. Many builders use 2 x 4-inches above the window and door openings, which necessitates use of small pieces forming a truss between the top of the opening and the plate. A less expensive, more efficient and structurally stronger framing can be obtained by specifying the distance from the underside of the plate to the top of the window frame as 6, 8, 10, or 14 inches, permitting the use of 2-inch planks of the given dimensions, doubled as shown in Fig. 8. An economical way of framing the corners so as to provide nailing for both the outer and inner wall coverings is to be found in the so-called "Dutch post," which is built up of three 2 x 4-inch studs.

Interior Wall Treatment. As the interior treatment of a house is much more expensive than the exterior, great care should be exercised in choosing the various materials and the methods of application. The use of wall board is generally costly unless the walls are to be papered, as wall paper can be directly applied on wall board. It is rather expensive to use wall boards with the necessary "cats," pointing up of the joints and taping them in order to obtain a sufficiently smooth surface to take an architectural finish. In the writer's experience it has been found cheaper to use plaster board and to apply a white coat to it, treating its surface with trowels, sponges, brushes, etc., in order to obtain the desired finish. A very satisfactory interior wall can be obtained at a minimum cost by using some kind of plaster-saver lath covered with a scratch coat and a sand-finished brown coat, thus omitting entirely the white coat. To such a wall it is necessary to apply a coat of sizing or the cost of subsequent painting will be rather high. What has been said about interior wall treatment is equally applicable to ceiling finishes. The cost of woodwork can be kept down to a minimum by using a single-member base in conjunction with the usual trim around doors and windows.

Roof Construction. A certain amount of the charm and effect of a house is dependent upon the shape of the roof and the materials used thereon. One of the most effective and inexpensive roof constructions consists of wood shingles laid $5\frac{1}{2}$ inches to the weather, nailed to 1 x 2-inch shingle lath. Lately No. 1 ribbon slate has been quoted at such a low figure that if laid on shingle lath, the cost may only be \$2 or \$3 more per square. Asphalt strip shingles laid on continuous sheathing are also a very economical form of roofing, and contrasting color effects may be obtained easily. However, such shingles have a tendency to curl eventually, and a double-dipped asphalt shingle will be found to be more economical, although it may increase the cost about \$4 a square. In designing a roof it should be

borne in mind that dormers, hips, valleys, etc., are expensive and should be avoided as far as possible. The cost of adding a small dormer containing a window may vary from \$20 to \$30. Great care should be exercised in detailing the roof overhang both on the rakes and eaves, and much trouble can be avoided if the shingles or roof sheathing is carried out over a moulding and bedded over it in mastic cement or other plastic, non-drying compound.

Fireplaces and Chimneys. Although open fireplaces are much to be desired in all houses, they should be avoided in speculative work if the expense is around \$300, unless it is felt that a fireplace will have great weight as a selling point and will thus pay its way. If a fireplace is desired, it should be so located as to contain all of the required flues in its surrounding brick masonry. Every house designed for winter occupancy in a northern climate must have a furnace, and if the building site is located where gas cannot be obtained, there should be an additional flue for the kitchen range. Fireplaces projecting through outer walls should be avoided, as the outer and visible part of the masonry must be given architectural treatment and this, as a rule, involves use of a greater quantity of brick. The beauty of such an outer chimney is not disputed, but it represents considerable expense. Furthermore, the type of house we are considering is usually occupied by families of small means, and it is a well known fact that an outside chimney is not as economical as one located entirely inside of the house, where the radiation of heat through the masonry helps to keep the house warm. An ideal location for a fireplace is shown in Fig. 1, where the masonry containing the flues need be of minimum dimensions, as only the chimney top is visible above the roof line.

Millwork. Another item that involves a great deal of expense is special millwork. In order to keep the cost down it is advisable to select standard millwork from the catalogs of reputable millwork concerns, and it is usually found that there is a sufficiently great variety of sizes and shapes offered to satisfy all reasonable requirements. In selecting the sizes of the windows, it should be borne in mind that the use of several different odd shapes or sizes on the same house involves unnecessary expense, because the carpenters must hunt among the frames to find the particular one wanted. It is, therefore, well to limit oneself to two or possibly three different sizes of windows and two sizes of interior doors. The most convenient sizes for interior doors are the stock 2 feet, 6 inches x 6 feet, 8 inches or 2 feet, 6 inches x 7 feet for room doors, 2 feet x 6 feet, 8 inches or 2 x 7 feet for closet doors. It will facilitate the construction if the "heads" of all door and window openings are at the same height above the floor.

Bathrooms. Nothing is more pleasing to the eye than a well proportioned bathroom with tile floor and walls, but unfortunately this involves use of

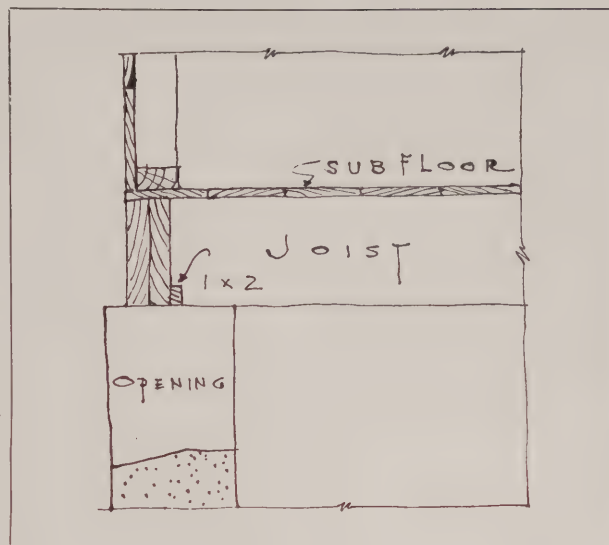


Fig. 7. Section Showing Sub-floor Running Through and Joists Resting on Minimum Nailing Strip

expensive materials and workmanship. Where strict economy is desired, the floors may be covered with linoleum. The walls, up to a height of 4 feet, can be provided with a wood sheathing to which may be secured one of several different types of wall board that have a pressed tile pattern. The upper edges of the boards may be covered by a $\frac{7}{8}$ x 2-inch or a $\frac{7}{8}$ x $2\frac{1}{2}$ -inch dado cap and the rest of the walls

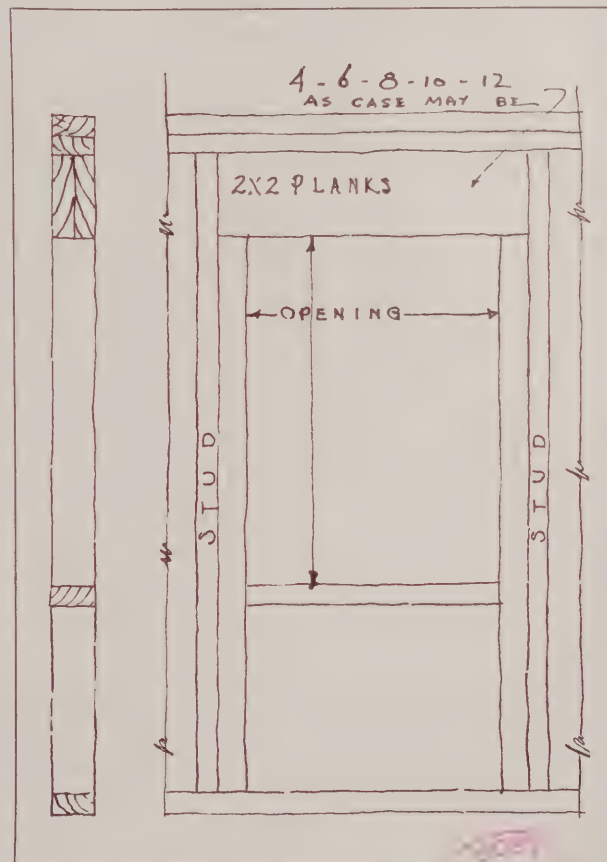


Fig. 8. Economical and Efficient Framing of Window and Door Openings

given two coats of sand-finished plaster. Another type of economical finish can be obtained by plastering the lower portion of the walls, but if such walls are not given an extra good coat of paint, they will soon disintegrate, especially around the bathtub and the lavatory. The fixtures can be selected from manufacturers' catalogs, and a local plumber consulted as to which fixtures he can obtain at reasonable prices. Often such plumbers are able to obtain a good grade of second-class fixtures that are unimpaired from a sanitary and mechanical standpoint, and there is no reason why such fixtures should not be acceptable. The use of brass pipe may be desirable in certain localities, and it behooves the architect to familiarize himself with the quality of the water in the particular locality. In many places, especially where good artesian water is available, wrought iron pipe will be found to give good and lasting service at low cost.

Heating. Many different opinions are put forward as to the most efficient and economical system of heating for a small house, but the writer has found none to compare with warm air systems in economy and efficiency. If a house is small, compact, and contains only one or two small rooms on the second floor, a pipeless furnace should be given serious consideration. If a house is beyond the capacity of a pipeless furnace, warm air systems should be looked into, especially those now used in many localities of this country. Many such have "cold air" registers inside of the house, and the furnace, therefore, is only called upon to add a few degrees of heat to this already heated air in order to keep the rooms at the desired temperature. There is a type in which an adequate amount of humidity is supplied to the air by the furnace. In this a surplus of water escapes from a humidifier into the ash pit, where it is evaporated and mixed with the air passing through the live coals, thus making the furnace act more or less as a gas producer, increasing the combustible value of the coal. For a small house a pipeless furnace could be installed for about \$150, and the warm air furnace would cost from \$300 to \$350, at the present writing. Should the house be of bungalow type and rather elongated, neither of the heating systems mentioned can be used, and it is necessary to resort to other types, using hot water, or high- or low-pressure steam or vapor. For the small house it is believed that the hot water system is the best, but due to the slowness of operation it can hardly be used satisfactorily in localities subject to sudden temperature changes. Steam will be more satisfactory in such places, as it is possible to drive such a heating plant and obtain quicker results.

Painting. Much money may be spent on the exterior and interior painting of a house, and much

of this can be eliminated where economy is the prime consideration. All outer trim and woodwork, including clapboards, must be painted with three coats of good lead and oil in order to prevent checking, but shingle and stucco walls may be left *au naturel*. The painting of the interior woodwork depends largely upon the class of material used. For instance, yellow pine trim may require a coat of shellac before applying the paint. For cypress or white pine, two coats of a good grade of paint are usually sufficient. A very satisfactory and inexpensive effect can be obtained by using yellow pine trim and simply staining it. For pine or fir doors it will be found economical to mix varnish with the first coat, using a flat white paint. A second coat of paint in the desired color will then suffice in order to obtain a satisfactory and economical finish. Sand-finished interior walls can be left without further treatment, but if they are to be painted they should be sized for oil paint, or a good grade of cold water paint applied.

Flooring. Sub-floors are absolutely necessary only in the first floor system, and then really only over unexcavated portions. Floors over basements and all second floors need not have sub-floors. It is advisable to have at least the living room provided with hardwood flooring, but in all other rooms to have a cheaper grade of fir or N. C. pine flooring. In kitchens and bathrooms, which are to be covered with linoleum, economy can be obtained by using flooring 6 inches wide of fir or spruce, but such flooring must be "face nailed" in order to prevent curling.

In Conclusion. The aim of this article is to emphasize the methods that can be used successfully in obtaining economical small houses without sacrificing their architectural beauty. Some months ago an architect said that in his opinion the days of the \$5,000 house had passed, and he was rather surprised when shown a house of sizable proportions which had just been completed within that amount, and that there were no secrets as to how this had been accomplished. The entire undertaking had been standardized to such an extent that several days before the building operation was begun, carpenters had been busy cutting studs, framing for window openings, joists, and roof rafters, and stacking them on the ground ready for use. The millwork was all selected from a manufacturer's catalog and was on the ground before the building was started, so that it was possible to place all exterior frames of the house before sheathing. Several changes had also been made in the plans in order to have as little waste as possible in the lumber, and the labor was so supervised and organized that every man knew exactly what to do next.

HEATING AND VENTILATING SYSTEMS IN PRELIMINARY DESIGN

BY

HAROLD L. ALT and PRICE L. ROGERS

HEATING AND VENTILATING ENGINEERS

THE procedure most frequently followed in the designing of the modern building would be humorous if it were not so expensive. As engineers of considerable experience in this class of work, the writers feel that the system they have encountered must be universal. The usual procedure is to have the architect make preliminary studies and to give these to the engineer, who approximates the amount of heating and ventilating necessary, making certain recommendations to the architect. The architect then begins to make a further serious study of the matter in an endeavor to incorporate the engineering requirements in the preliminary designs without destroying the general scheme. In making various alterations to do this, certain improvements suggest themselves and are also incorporated. Other suggestions of the engineer it may be impossible to accommodate in the preliminary design as contemplated, and the architect then makes some really radical departures from the original scheme in order to give the engineer what he wants. One good turn deserves another, and one little change often results in several more, so that by the time the plans go to the engineer a second time they are often,—as far as heating and ventilating are concerned,—unrecognizable to the engineer. As a result of this the engineer starts all over again and has to develop an entirely new set of requirements to suit the revised layout. Then the architect takes another try at it and again revises; this game of battledore and shuttlecock goes on until the alterations and their effect on the heating and ventilating system become small enough to be practically negligible. At this point the plans may be said really to be ready for the engineer to begin his work of the incorporating of the equipment.

There are so many ways and means of heating and ventilating that to lay down hard and fast rules for the architect's information is exceedingly difficult; one engineer will ventilate in a manner that another engineer wouldn't use under any circumstances, and another engineer will design a heating system entirely different from that employed by some of his engineering brothers. Yet each one is going by what his experience has taught him and is using, to the best of his ability, his brains and his craft to produce the most for the owner's investment. And neither can be condemned any more than one of two architectural designs can be condemned when they are of equal beauty and practical utility.

Inadequate Preliminary Drawings. Preliminary plans are often inadequate,—as far as heating and ventilating are concerned,—especially in the matters of,

- (a) Boiler Room Space,
- (b) Chimney Sizes,
- (c) Flue and Duct Spaces,
- (d) Pent Houses for Fans,
- (e) Connecting Openings between Boiler Room and Building.

Of all the items listed, the first seems to be that which gives the most trouble. Even in finished designs, boiler rooms are often too small, incorrectly located, and put in places to which access is difficult. In preliminary drawings the boiler room area is not only insufficient as a rule, but the height is almost as often entirely inadequate, necessitating the raising of ceilings or the dropping of floors, to allow boilers and steam piping to be installed. When considering the location of the boiler room it is most important to select a location where the handling of coal, ashes or oil will be convenient, and where the steam may be distributed to the building in an economical manner from the standpoint of the pipe layout. Since the greatest heating load usually occurs on the north and west sides of a building, it is often desirable to locate the center of steam distribution somewhere near the northwest corner. In H-shaped buildings the best position is generally in the cross-bar of the H. It is evident that this placing of the boiler room will result in shorter average runs and in reducing the amount of large-size pipe required.

Next to the boiler room difficulty, and it is a close second, is the matter of size and height of the chimney. Often a high chimney might seriously affect the architectural beauty of the building; yet the architectural beauty will not keep the tenants of the building warm, and that is what the high chimney might aid in doing. In recent years this question of chimney height has in many cases provided its own answer because of the increasing heights of new buildings; yet, even today, the average building seldom has the height necessary to give adequate draft without extending the chimney a considerable distance above the roof.

Hardly less important is the matter of duct and flue space; here the difficulty is not so hard to understand, because the amount of duct and flue space is not fully determined until the ventilation requirements of the building have been decided upon, and the exact locations of these ducts and flues are often unknown even to the engineer until he begins trying to install the ventilating system. Ventilation differs so profoundly in various types of buildings that the space entirely suitable for one type of structure is absolutely unsuited for another type of equal cubage. There are *upward* ventilation and

downward ventilation, ventilation *without* cooling and ventilation *with* cooling, and sometimes no ventilation at all. Consequently, in talking about duct and flue spaces, the type and size of the building itself will control the amount of space needed for ducts and flues, and the method of ventilating will have large influence in determining where these spaces should come. Pent houses on the roof are normally the least difficult of all details to take care of, but their general locations should be selected and sufficiently strong construction provided that these structures may be added when required without affecting the framing way down to the basement.

Approximating the Heating Requirements. Assuming that the approximate cubage of a building is known, it is possible to approximate the heating requirements where the outside temperature goes to zero by dividing the total cubage by the factors shown in Table I. This gives the total radiation which would be necessary if ordinary standard cast iron radiation were used. Of course it is only approximate. This amount of radiation will be called the equivalent amount of direct radiation required and, hereafter, will be abbreviated to E.D.R. (Equivalent Direct Radiation). From this E.D.R. the boiler size can be determined, as far as the heating is concerned, by choosing a boiler that will give this amount of radiation. In other climates this E.D.R. will vary as the temperature outside rises, and in this manner, with zero outside and 70° Fahr. inside, the difference between the room temperature and the outside temperature is 70° Fahr. With any other difference, the E.D.R. will be found by using the equation,—Actual Temperature Difference ÷ 70 × E.D.R. equals Actual E.D.R. Thus if the building were situated in a climate where the minimum outside temperature only fell to 35° Fahr., the E.D.R. as calculated using the factors in Table I would have to be modified to

$35/70 \times \text{E.D.R.}$ which equals $\frac{1}{2}$ E.D.R.

which is only another way of saying that, with half of the temperature difference, the equivalent direct radiation would also be only half, and, with three-quarters of the temperature difference, the E.D.R. would be only three-quarters as much.

TABLE I

Divisors to be Used to Determine the Approximate Direct Radiation Load in Various Types of Buildings

<i>Class of Buildings</i>	<i>No. of Buildings Averaged</i>	<i>Ratio of E. D. R. to Cubage</i>
Residences,	16	1 to 46
Churches,	4	1 to 86
Schools (private—no ventilation),	2	1 to 72
Schools (public—ventilated),	4	1 to 72
Factories (60° rise only),	10	1 to 72
Office Buildings,	9	1 to 76
Apartment Houses,	11	1 to 76
Hotels,	15	1 to 74
Hospitals.	3	1 to 66

Note—By “cubage” of a building as used in the above table is meant the *total* cubage which has been computed, exclusive of attics and unheated spaces.

Approximating the Ventilation Requirements. With ventilation the figures will be less accurate because the quantity of ventilation is not fixed by such a positive factor as the outside temperature. In calculating probable ventilation requirements, only average conditions can be assumed, and they will not fit any special case exactly, although they should fit approximately.

It has been found in various buildings that, with reasonably good ventilation throughout,—say, three to six air changes per hour,—the ventilation load will run about 100 per cent of the radiation load. Where excellent ventilation is expected, this figure may be increased to 150 per cent, while in buildings where the air changes are to be cut down to the minimum the additional load may be only in the neighborhood of 50 per cent of the E.D.R. for the same building. Such figures will apply to office buildings, institutions, hospitals and other buildings where the occupants are not crowded together in confined spaces, such as occur in auditoriums and school buildings.

Developing the Boiler Capacity Required. To obtain the approximate boiler horse power necessary for the building, it is only necessary to divide the sum of the E.D.R. for heating plus the E.D.R. for ventilating, plus about 25 per cent for hot water and incidentals, by 100. For example, suppose a hospital of 1,000,000 cubic feet with fairly good ventilation expected and a minimum outside temperature of 10° Fahr. above zero. The E.D.R. for heating would be for zero outside. . . .

1,000,000/66 or 15,151 sq. ft. for heating
but as the outside only goes to 10° Fahr. above zero the E. D. R. is revised to

60/70 of 15,151 or 12,986 sq. ft., say 13,000 sq. ft., and with fair ventilation throughout, the ventilation load would add about 100 per cent, or 13,000 square feet more, making a combined load of

13,000 sq. ft. E. D. R. for heating,
13,000 sq. ft. E.D.R. for ventilating,

26,000 sq. ft. E.D.R. combined load,
6,500 sq. ft. for incidentals,

32,500 sq. ft. E.D.R. total which, divided by 100, equals 325 boiler horse power. In order to have one spare boiler, it is logical to assume that three boilers would be used, each of 160 b.h.p.

There are boilers of all shapes, makes, and sizes; long and short, high and low, water-tube, fire-tube, etc.; no boiler room could accommodate *efficiently* all types of boilers; yet it is wise to try to make the boiler room large enough to accommodate any one of several types of boilers large enough for the building. The three most general classifications of boilers are, cast-iron sectional for low-pressure use;

Boiler Horse- power	Steel Boilers						Cast Iron		
	High Pressure Water Tube			Low Pressure Fire Tube			Low Pressure Horizontal		
	Wdth.	Lgth.	Hgth.	Wdth.	Lgth.	Hgth.	Wdth.	Lgth.	Hgth.
50	-	-	-	⁽²⁾ 23'	20'	14'	⁽²⁾ 21'	20'	13'
100	⁽²⁾ 42'	19'	19'	⁽²⁾ 23'	25'	16'	⁽²⁾ 21'	22'	13'
150	⁽²⁾ 42'	21'	19'	⁽²⁾ 25'	27'	20'	⁽³⁾ 31'	21'	13'
200	⁽²⁾ 42'	22'	19'	⁽³⁾ 33'	26'	16'	⁽³⁾ 31'	23'	13'
250	⁽²⁾ 42'	27'	19'	⁽³⁾ 33'	28'	18'	⁽⁴⁾ 39'	21'	13'
300	⁽²⁾ 42'	33'	19'	⁽³⁾ 36'	29'	20'	⁽⁴⁾ 39'	23'	13'
350	⁽³⁾ 42'	48'	19'	⁽³⁾ 36'	32'	20'	⁽⁵⁾ 48'	22'	13'
400	⁽³⁾ 42'	37'	19'	⁽³⁾ 36'	34'	20'	⁽⁵⁾ 48'	21'	13'
450	⁽³⁾ 42'	39'	19'	⁽³⁾ 36'	35'	20'	⁽⁵⁾ 48'	24'	13'
500	⁽³⁾ 42'	39'	19'	⁽⁴⁾ 47'	31'	20'	⁽⁶⁾ 57'	23'	13'
550	⁽³⁾ 42'	43'	19'	⁽⁴⁾ 47'	33'	20'	⁽⁶⁾ 57'	24'	13'
600	⁽³⁾ 42'	43'	19'	⁽⁴⁾ 47'	35'	20'	⁽⁷⁾ 66'	23'	13'
650	⁽⁴⁾ 42'	45'	19'	⁽⁴⁾ 47'	35'	20'	⁽⁷⁾ 66'	24'	13'
700	⁽⁴⁾ 42'	45'	19'	⁽⁴⁾ 47'	37'	20'	⁽⁸⁾ 75'	23'	13'
750	⁽⁴⁾ 42'	48'	19'	⁽⁵⁾ 58'	31'	20'	⁽⁸⁾ 75'	24'	13'
800	⁽⁴⁾ 42'	48'	19'	⁽⁵⁾ 58'	33'	20'	-	-	-
850	⁽⁴⁾ 42'	48'	19'	⁽⁵⁾ 58'	35'	20'	-	-	-
900	⁽⁴⁾ 42'	48'	19'	⁽⁵⁾ 58'	38'	20'	-	-	-
950	⁽⁵⁾ 42'	60'	19'	⁽⁶⁾ 69'	33'	20'	-	-	-
1000	⁽⁵⁾ 42'	60'	19'	⁽⁶⁾ 69'	37'	20'	-	-	-
1100	⁽⁶⁾ 42'	66'	19'	⁽⁶⁾ 69'	37'	20'	-	-	-
1200	⁽⁶⁾ 42'	66'	19'	⁽⁸⁾ 91'	31'	20'	-	-	-

TABLE II

TABLE SHOWING APPROXIMATE DIMENSIONS FOR BOILER ROOMS BASED ON THE USE OF HIGH-PRESSURE CROSS-DRUM STEEL BOILERS, LOW-PRESSURE FIRE-TUBE STEEL FIREBOX BOILERS, AND CAST-IRON LOW-PRESSURE HORIZONTAL SECTIONAL BOILERS

Note. Figures in parentheses as (1), (2), (3), etc., indicate the number of boilers contemplated, of which one will be a spare. If mechanical stokers are to be used on water-tube boilers, reduce the length about 40 per cent and add 5 feet to the height.

steel fire-tube for low-pressure; and steel water-tube for high-pressure. For this reason the architect should decide as soon as possible if high-pressure steam will be needed for any purpose and, if not, whether he wants to use low-pressure steel boilers, or the cast iron sectional type. It will make a great difference with the boiler room in many ways, and competent advice should be sought if it is not available in the architect's own office.

Dimensions of Boiler Rooms. Table II shows the approximate dimensions of boiler rooms required for plants of different types, including the minimum height necessary to accommodate such boilers. It should be noted that where mechanical stokers are to be placed under water-tube boilers, the height must be increased about 5 feet, as boilers are usually set higher for stokers than for hand firing. Oil fuel often makes it necessary to raise fire-tube boilers to get sufficient combustion space, but this amount of rise is not generally enough to affect the height of the boiler room materially. It is important to remember that with steel boilers space must be provided either at the front or at the rear sufficient to draw the tubes for cleaning or repair; this, in most cases, nearly equals the length of the boiler. If a boiler room is sized according to the information given in Table II, it may not be possible to get every manufacturer's boiler into this space, but *most* boilers will go in, and it is assured that, at least, *some* boiler will fit.

It must be understood that the dimensions given in Table II include space for boilers only; usually there are certain other pieces of apparatus, such as boiler-feed pumps, automatic-return pumps, vacuum pumps, feed-water heaters, house pumps, water filters, air compressors, hot-water heaters and storage tanks, which will have to be accommodated in space outside of that quoted. It might be said that a floor area of about 50 per cent of the boiler room is generally sufficient to receive all such equipment.

Chimneys for Boiler Plants. Consideration should be given to the fact that a certain height must be provided to produce the *intensity* of draft, and a certain area is required to carry off the *volume* of gas. The exact minimum height cannot be determined until the full details of the steam plant are decided upon and the overload—if any—on the boilers determined. Approximations covering average conditions are quoted in Table III, which may serve to give some idea of the height and size necessary as soon as the boiler load has been calculated as previously explained. For oil-burning plants the height of chimney usually need not exceed 80 feet, and the area—not the diameter—need be only about two-thirds of the area which would be required for a coal installation. Care should be taken of course to be sure that the use of coal in the future is such a remote possibility that it may be neglected before the area of the chimney is reduced, as height can be added, but to increase diameter is usually impossible after the chimney is once built.

Boiler Horse- power	Coal		Oil	
	Dia. In.	Hgth. Ft.	Dia. In.	Hgth. Ft.
50	21	50	18	80
100	27	60	22	80
150	30	70	24	80
200	36	80	30	80
250	40	90	34	80
300	42	100	36	80
350	42	110	36	80
400	48	110	40	80
450	48	125	40	80
500	54	100	45	80
550	54	110	45	80
600	60	100	50	80
650	60	110	50	80
700	60	125	50	80
750	66	100	54	80
800	66	110	54	90
850	66	125	54	90
900	72	110	60	90
950	72	110	60	90
1000	72	125	60	90
1100	72	150	60	100
1200	78	125	66	100

TABLE III

Showing Approximate Diameters and Heights of Chimneys for Various Sizes of Plants, Using Coal or Oil Fuel

Mechanical Draft Objectionable. Low chimneys are sometimes necessary and can be used only in combination with some form of mechanical draft. Any artificial means of draft production is expensive, as it entails greater internal losses in the boiler plant and introduces additional expense in the first cost, which in turn raises the interest charge and depreciation. Mechanical draft should be avoided wherever possible. The little undergrate electric-driven blower for intermittent use is a cheap and useful adjunct to a building's heating plant, but installations carrying mechanical draft beyond this point are of questionable desirability.

Areas for Toilet Exhausts. In regard to duct and flue spaces necessary to ventilate, the toilets will have a larger air change than the ordinary rooms, so that this must be allowed for in settling the duct area required. If it is assumed that the toilet, locker and similar rooms are exhausted to the extent of ten air changes per hour, the duct area in square feet near the toilet will be $\frac{1}{2400}$ of the cubage ventilated, this gradually decreasing as the fan is approached to a point close to the fan, where the area will be about $\frac{1}{6000}$ of the cubage handled.

For example, assume a toilet and locker room of a total cubic contents of 5,000 feet, and about half-way from this toilet room to the fan is located a second room of 3,000 cubic feet. Then the duct area for the first room will be

$$5,000 \times \frac{1}{2400} \text{ or } 2\frac{1}{4} \text{ sq. ft.}$$

and where the second room comes in the duct for the second room will be

$$3,000 \times \frac{1}{2400} \text{ or } 1\frac{1}{4} \text{ sq. ft.}$$

As the two ducts unite at a point about half-way to the fan, the combined duct will have an area about half-way between $\frac{1}{2400}$ and $\frac{1}{6000}$ or, say, $\frac{1}{4200}$ of the total cubage handled. Then

$$(5,000 + 3,000) \times \frac{1}{4200} = 2 \text{ sq. ft. area}$$

and if no more connections come in, the area at the fan would reduce to

$$(5,000 + 3,000) \times \frac{1}{6000} \text{ or } 1\frac{1}{2} \text{ sq. ft. approx.}$$

Areas for Ordinary Ventilation. In other rooms, involving normal ventilation of say six air changes per hour, the factors would change from $\frac{1}{4000}$ at the room, down to $\frac{1}{10000}$ at the fan; and rooms with ducts connecting into the main line at intermediate points would have the main line duct carrying the total of all rooms supplied beyond any given point, and the factor would be approximately proportional to the distance of the point from the fan. That is, at a point one-quarter of the way from the fan to the end of the system the factor would be about $\frac{1}{8500}$, a point half-way between the fan and the end

of the system would use about $\frac{1}{7000}$, and one three-quarters of the way would use $\frac{1}{5500}$.

To illustrate, assume two rooms with a cubage of 2500 each at the point farthest from the fan, another room with a cubic of 7000 cubic feet about one-third the distance nearer the fan, and a fourth room of 5500 cubic feet very close to the fan. The areas which will have to be provided to accommodate ducts and flues for these rooms will be:

First two rooms, $2500 \times 2 \times \frac{1}{4000}$ or $1\frac{1}{4}$ sq. ft.

After taking on the next room the area will increase to

$$[(2500 \times 2) + 7000] \times \frac{1}{6000} \text{ or } 2 \text{ sq. ft.}$$

When the fourth room is added the duct area becomes $(2500 \times 2 + 7000 + 5500) \times \frac{1}{10000}$ or $1\frac{3}{4}$ sq. ft. Supply ducts can be approximately determined by the same method.

Theaters and Schools Require Special Consideration. In theater work the cubic contents need not be considered, as the ventilation is based entirely on the number of occupants, and running from 20 to 25 cubic feet per minute per occupant. Schools follow the same rule except that they use 30 cubic feet per pupil. In these cases it is only necessary to multiply the number of occupants by the cubic feet supplied per hour and use one-sixth of this figure in place of the cubic contents to determine the duct sizes. When cooling is to be installed, the air quantity for theaters must be materially increased, reaching nearly double, and, sometimes full double that required for plain ventilation. It is essential that the sizes of ducts and flues running to the roof space over the auditorium must be sufficient to supply all occupants in the gallery and on the ground floor except the seats under the balcony; these should be supplied from the ceiling under the balcony and not from the main ceiling.

Theater Duct and Flue Areas. For every occupant supplied from the main ceiling, about 0.025 square feet of flue or duct area must be allowed, and for every occupant seated under the balcony about 0.033 square feet. The exhaust leaving at the floor either through the usual mushroom, or by other means, may be sized in the same manner, except that it must be remembered that the mushrooms in the balcony should care for all balcony seats and the mushrooms in the main floor for all the main floor seats.

As an example of the application of this, assume a theater of 3000 capacity with 1000 in the balcony and 800 under the balcony. With plain ventilation the duct going to the roof space above the main ceiling would have to carry air for all seats except the 800 under the balcony, so that the size of this duct would be

$$(3000 - 800) \times 0.025 \text{ or } 55 \text{ sq. ft.}$$

and the size of the duct going to the registers in the ceiling under the balcony would be

$$800 \times 0.033 \text{ or } 26 \text{ sq. ft.}$$

while the duct coming from the balcony mushrooms would be

1000×0.033 or 33 sq. ft.

and the duct from the ground floor mushrooms would be

2000×0.025 or 50 sq. ft.

When cooling is to be carried on, these areas should be increased by at least 90 per cent.

School Flues and Ducts. In schools the air quantity often required by law is 30 cubic feet per minute per pupil, and the average schoolroom works out with a supply flue and an exhaust flue each of $3\frac{3}{4}$ to 4 square feet area, assuming 50 pupils. Where trunk lines are used, such as in the attic exhaust lines, the area of the trunk line will run from 0.075 square feet per pupil served at the far end down to 0.03 square feet per pupil served near the fan. Intermediate points will range between these two figures, as has already been explained. In the basement the total duct area will keep within the same limits, although if single ducts are used for each room the basement duct area will be not less than 0.04 square foot per pupil. Where unit heaters are used, exhaust flues only will be required, flues generally terminating in a plenum space in the attic.

Apparatus Rooms. The sizing of apparatus rooms, i. e., the rooms for receiving ventilating equipment, will vary considerably in different apparatus arrangements; where pre-heaters, air washers, re-heaters, and fan are used, the length of the apparatus room, in order to set these in proper order and continuously in line, may be between 27 feet and 35 feet, the longer dimension being required for larger sets of apparatus. The width of the room will vary with the quantity of air being handled, and the width of the air washer should first be developed. This can be determined by calculating the air washer area, which is obtained by dividing the cubage ventilated by 5000. Then, if the height of the air washer is approximately equal to the width, the width will be the square root of the area, and the height will be the square root of the area plus about 2 feet for the pan under the washer. In cases where it is desired to keep within a limited headroom, the area of the washer may be divided by the headroom minus 2 feet, in order to determine the width. The width of the room must be sufficient to accommodate not only the washer but the circulating pump and the connections to the heaters, and to leave a working space around the apparatus. Therefore the width of the room should be approximately the width of air washer plus 8 feet.

As an example, assume that ventilation is being supplied to a cubage of 1,000,000 feet and the size of apparatus room is desired where headroom of 13 feet is obtainable. Then the area of the air washer

$\frac{1,000,000}{5000}$

will be ——— or 200 square feet, and as the head-

room

is 13 feet, the width of the washer will

200

be ——— because the pan under the washer and a

13-2

little clearance over the top will equal a reduction of 2 feet in the effective washer height.

$\frac{200}{11}$ is 18 feet, the width of washer.

18 feet plus 8 feet equals 26 feet, the width of room. The length of room (as this is a large capacity equipment) will be about 30 feet. The height of room has already been given as 13 feet.

Pent Houses on Roofs. Some idea of the probable size of the pent house for exhaust fans on the roof may be gained by assuming it to be a cube, the cubage of which equals the cubage ventilated divided by 250. This assumption will do down to pent houses of about 200 cubic feet capacity for direct-connected exhaust fans, and down to about 500 cubic feet in the pent houses for belted fan installations. No pent house should be made for less than these minimum amounts, and for belted fans the dimension of the pent house parallel to the belt should not be less than 12 to 13 feet on small units, up to 17 feet or so on large units serving a million cubic feet in the ventilated portion of the building.

Fuel Storage. It is generally conceded that the absolute minimum fuel storage allowable is a three-day supply to take care of a holiday falling on Monday, etc. In Table IV is given a schedule covering the number of cubic feet of storage space necessary for one day's supply of coal and the number of gallons necessary for one day's oil consumption. These amounts can be multiplied by the number of days desired, and the total will be the space required. It should not be forgotten that the amounts quoted in Table IV are the amounts based on a heating plant operating at 100 per cent of its capacity; in other words, they are based on extreme weather conditions, and in ordinary winter weather, with the temperature around 30° to 35° Fahr., the fuel consumption will only run about half as much as indicated.

TABLE IV

Approximate Fuel Consumption for One Day of Extreme Weather

Horsepower	Soft Coal	Weight	Hard Coal	Oil
Required	Cu. Ft.	Tons	Cu. Ft.	Gals.
50	94	2	90	340
100	188	4	180	680
150	282	6	270	1020
200	376	8	360	1360
250	470	10	450	1700
300	564	12	540	2040
350	658	14	630	2380
400	752	16	720	2720
500	940	20	900	3440
600	1128	24	1080	4080
800	1504	32	1440	5440
1000	1880	40	1800	6800
1200	2256	48	2160	8160

Note. This is figured on running 24 hours per day; for 18-hour periods of operation use $\frac{3}{4}$ of these quantities, and for 12-hour operation use $\frac{1}{2}$. If a cheap, heavy oil is to be used, the number of gallons given may be increased by about 40 per cent.

ARCHITECTURAL LAW

ZONING, TRAFFIC, AND BUILDING TYPES

BY

ARTHUR C. HOLDEN, ARCHITECT

Editor's Note.—Leonard Cox, of the office of Arthur C. Holden & Associates, Architects, is serving as Architectural Consultant to the Temporary Commission to Examine and Revise the Tenement House Law. In the standards recommended herein, Mr. Holden has closely followed the standards proposed in the report of the Commission to the state legislature. The text itself is a part of recommendations made for the amendment of the Building Zone Resolution of the City of New York.

IN the discussion of congestion today we hear much concerning the high building and of overtaxed streets. Many generalizations are made as to whether or not our skyscrapers are a blessing or a menace; whether they should be permitted or legislated out of existence; and whether or not it is possible to do something to the streets that will make it possible for them to function a little better. There is some show of debate, too, as to whether traffic is as bad or worse in a city of low buildings like London than in our own skyscraper town of New York. In all this welter of discussion there has so far been little attempt to analyze the situation and separate individual facts from generalizations of opinion.

Divergence of Skyscraper Types. It may be just possible that high buildings need not be condemned *en masse*. Perhaps all skyscrapers are not alike; some may be good and desirable, while others may be harmful and therefore not so desirable. Some may cause congestion, and others may reduce congestion. Perhaps the deplorable congestion of street traffic may in some cases actually be due to high buildings, and in others to the increasing use of the automobile, and in still other cases the cause may be a bad street plan. The attempt to differentiate should at least be made. There have been developed in the last dozen years three main types of the very tall building,—the office type, the residential type, and the loft type. Of these only one,—the office building,—had begun to approach its present stage of development in New York when the zoning law regulating height and bulk of buildings was passed in 1926.

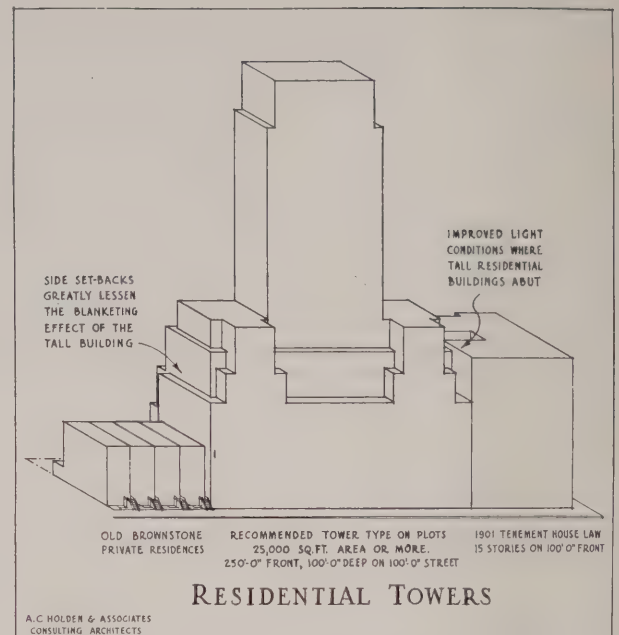
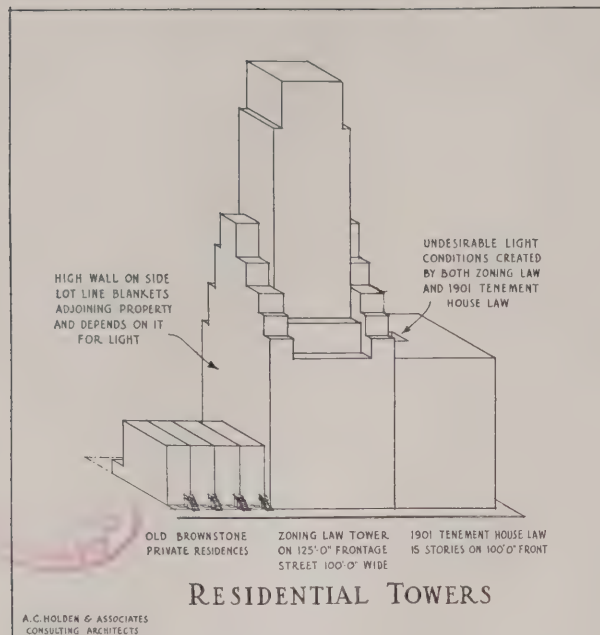
The zoning law established limitations upon the *uses* of buildings within prescribed areas. By such means business was kept out of purely residential districts, and heavy or objectionable manufacturing was in turn kept out of business districts. The law also established limitations upon the *area* of the lot permitted to be built upon. These restrictions were designed primarily to protect certain types of residential structures, though the extent of coverage allowed was of necessity influenced by the location and economic usefulness of the property. On the other hand, in the case of *height* restrictions, the zones established were designed to deal principally with office buildings, and in this case also the economic value of the property was the governing factor

in the height permitted. The financial district had long suffered from the small sizes of plottages available. As a result, great care was taken in framing the law not to make the height limitations and the setbacks required too burdensome.

It was originally not thought necessary to differentiate as to heights and setbacks allowed for various types and uses of buildings. The development of neither residential nor loft buildings had been carried to a point where they created special problems of a character to be dealt with under the zoning act. As a result, so far as height and bulk were concerned, the same law governed the construction of office buildings, manufacturing loft buildings and certain classes of residential buildings. The severity of the restrictions as to height and bulk depended solely upon the height or area district in which the property happened to be located. As has already been indicated, the economic value of the land had been the controlling factor in fixing these restrictions. The greatest concern was exercised with regard to high value of land. It was deemed necessary to permit such heights as would not cause hardship or loss to the owners of valuable land. The tendency was therefore to scale up the allowable limitation generally so as not to appear to discriminate unduly against land in less desirable sections. The tendency of all land values to advance toward the economic limit set by ultimate permitted use was unforeseen. Attention was focused upon the expected uses. Because the resultant developments were expected to be desirable, no differentiation was made which related the size and shape of the building to other probable uses. The possibility had apparently been overlooked that certain other uses for buildings of great height and bulk might create problems capable of threatening the health and efficiency of the community.

Residential Buildings. It was originally supposed that the height and bulk of residential buildings were controlled in the main by the state tenement house act, but it was ultimately discovered that by definition the tenement house act governed only the construction of buildings where three or more families did their cooking. One had only to pledge the tenants of the building not to cook, and the building was exempted from the more stringent requirements for court sizes, light, and air, and even exits imposed by the tenement house law.

Under the influence of natural economic pressure, the exterior aspects of a certain class of fireproof residential buildings therefore began to take on the aspect of the well known office skyscraper of the financial district. Now this was all very well at the



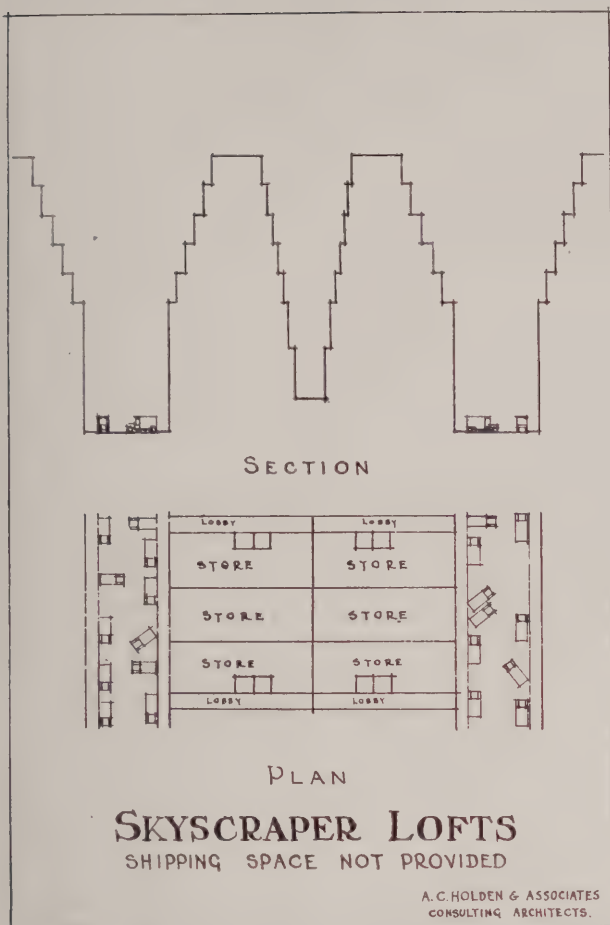
The tower in the center is made possible by the failure of the tenement house law of 1901 to provide limitations upon the height of residential buildings. The root of the trouble lies in an unenforceable definition of a tenement house. As land values increase, residential buildings tend to expand to the limits set by the zoning law, which permits the blanketing of adjoining properties, and insufficient light courts, and creates undesirable living conditions.

The tower in the center, according to the recommendations made, will be permitted only when 25,000 square feet or more are assembled in one plot. The mass of the building will be required to set back from the lot line with a height 5 feet greater than the width of the street on which the building fronts. This feature is a protection to the adjoining 15-story tenement (1901 law) on the corner, as well as to the old fashioned 4-story brownstone fronts.

start. The first skyscraper residential building in a block meant exceptionally good light and air for its own tenants, but it meant shadows and dark rooms for adjoining property owners. Where, however, skyscraper residential buildings ultimately become built up closely together, it means that the one damages the other. It means that although the upper stories may remain extremely desirable, the lower floors become not only undesirable but actually unhealthful for the reason that no sunlight can penetrate the excessively deep courts. While such courts may be quite possible in office buildings, which are occupied on the average eight hours during the day, there is a very different story to tell when the buildings are occupied both day and night. Doctors are united in their contention that all living quarters should be exposed during at least a portion of the day to the play of direct sunlight. The Committee on the Regional Plan of New York and Environs has carefully studied the question of sunlight penetration into living quarters and reports that it should be possible to determine minimum requirements for courts and window sizes by the minimum healthful standards of sunlight penetration. It is therefore a sound public health policy to impose restrictions as to height and bulk which are more stringent in the case of residential than in the case of office buildings. Such a policy, moreover, is to be recommended because it is an equitable protection to adjoining property owners. The great impetus that the development of apartment hotels and hotel buildings has attained today makes it imperative that height and bulk

requirements should be immediately revised to differentiate between residential and office buildings. The forthcoming recommendations for the revision of the state tenement house law will mark the first step in the direction of such differentiation.

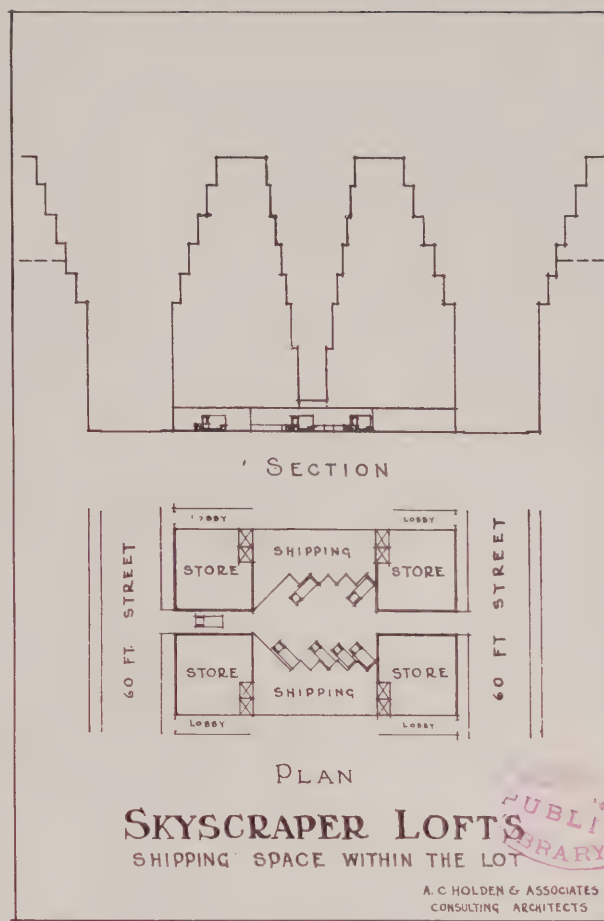
Manufacturing and Loft Buildings. Residential buildings, however, are not the only structures which because of their use call for special restrictions upon height and bulk. In all of the outcry today against congestion, more is being said about traffic than we have ever heard before. The work that is done in buildings has perhaps as much to do with the origination of traffic as any other single cause. Buildings where manufacturing is done are the direct cause of the origination of much of our heaviest traffic. Our zoning law as at present worded permits loft buildings to be carried to the same heights as office buildings. The modern, high-powered, express freight elevator has made this possible. The law does differentiate as to zones where light manufacturing and heavy manufacturing may be carried on. Where the economic value of the land is great, however, the height and area zones are likely to permit excessive development in height and bulk irrespective of the use to which the building is to be put. As a result of this situation, it is small wonder that in our newest manufacturing sections the streets are inadequate to take care of the traffic. It brings small relief to be able to reflect that it is the economic value of land that has virtually forced the skyscraper type of loft building. The setbacks required by law do, it is true, give far better conditions of light and air than



The section shows the amount of street occupied by a truck backed up to the curb. High loft buildings increase the use of the sidewalks for shipping and produce conditions intolerable for trucking, besides making traffic conditions practically unbearable with trucks backed up in such a way as to occupy approximately half of the street.

have ever been obtainable in lofts before, but the taller buildings create a problem in traffic congestion which is carried at times even to the point of traffic stagnation. At the present time, in manufacturing loft districts, the sidewalks are used as shipping platforms. One line of trucks at each side of the street waiting to receive or discharge goods narrows the space available for the passage of traffic. Such conditions result in constant traffic jams. The price that industry pays for this is higher shipping and transportation costs, which are added directly to the cost of doing business. An amendment to the zoning law which will cut down the permitted height and bulk of manufacturing loft buildings to within the traffic and shipping limitations of the streets is urgently needed. Additional height and bulk may be allowed, however, where adequate trucking space for shipping and driving through, is provided for in the ground stories of the buildings. Where economic pressure has once commenced to operate to increase the height of a type of building up to the point where the traffic conditions created become a menace, the tendency can be checked only by restrictions by law.

Recommendations. Attention should be focused upon the differences in use in our present skyscraper



The section shows a tunnel through the building, and the plan shows a possible arrangement of special shipping space within the lot. Several building owners might cooperate to allow for shipping space in their interiors. Allowed heights of new loft buildings should bear a fixed relation to the shipping area provided.

types, and from these differences, with due consideration to safety, public health and the expeditious handling of the city's work, there should be worked out diversified requirements as to height and bulk. For example, in residential sections it is wise to keep walls as far as possible away from interior lot lines. It is wise, also, to require setbacks on the side lot lines, to prevent the erection of a solid row of buildings of excessive height likely to effectively shut off sunlight from buildings located on the northern side of such a row. There is great advantage in retaining openings between buildings through which it is possible for sunlight to penetrate. In the case of residential buildings also, it is both expedient and wise to make the angle for minimum setback requirements sharper than that, for example, required of office buildings.

The policy that may well govern the framers of a revision of the law is to balance, on the one hand, stringent regulation designed to check undesirable tendencies against liberal allowances extended in reward for conformity to sound principles of development. For example, loft and manufacturing buildings, though open to drastic restrictions as to height and bulk, may be permitted both greater bulk in the



The heavy industrial areas of Chicago have naturally followed the radiating railroad lines upon which the city is dependent. The zoning commission has endeavored to preserve adjoining areas available for residence.

lower stories and greater height for the setback stories where complete provision is made inside the buildings for trucking, shipping, and driving through. There are, of course, other matters ripe for consideration in a possible revision of the zoning law. In particular there is the growing need for the reservation of residential zones in proximity to manufacturing and mercantile districts. Problems of this sort have developed since the original passage of the ordinance, and are even at this time beginning to demand attention. By such provisions the city's transportation burden may be in some degree lightened. Most immediate, however, are the considerations which have to do with the proper study and the discovery of the proper interrelation of the factors of height, bulk, and use.

Unrestricted Districts Not Satisfactory. At the present time there are within Manhattan vast districts which so far as modern use is concerned are virtually undeveloped. Nor has there yet been worked out any progressive plan for their development. Until recently it has been assumed that as the city grew industry would expand into these districts, and for this reason most of these localities have been designated upon the city zoning map as "Unrestricted," as to use. On the other hand, there has been a great deal of propaganda recently about "rebuilding the slums." Much that has been said on this subject is purely sentimental. The old buildings

in these so-called "slum areas" have certainly fallen into a shocking condition. It is something to stir the deepest sentiments of any true American that his fellow citizens should be asked to pay rent to live in such habitations. The rents that are paid, however, are held at their present levels because of the potential market valuations of the land upon which the old tenements stand. Considered simply as dwellings, a great number of these old tenements are a losing proposition to their owners. The gradual expansion of industry into these old, unrestricted districts has enabled tenement owners to hold their property in spite of rental losses in the hope that ultimate sales at high enough figures will more than pay back the losses during the period when the property was carried as a slum.

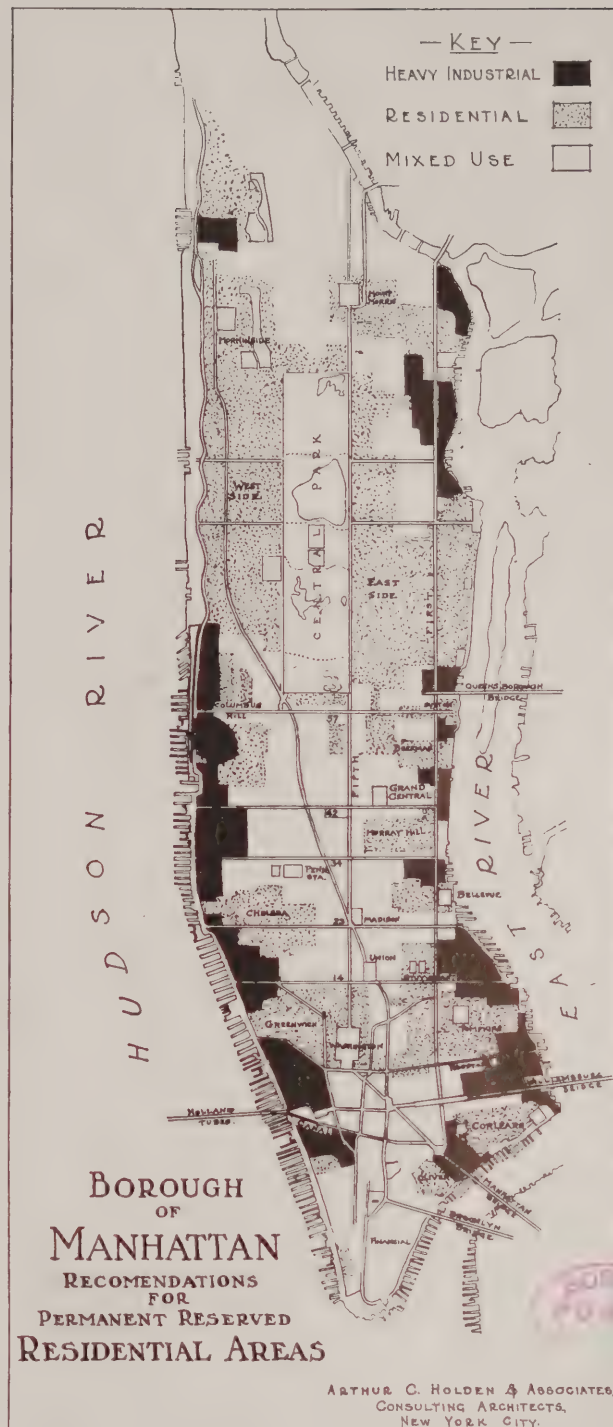
The Case of "San Juan Hill." A typical instance is the course that property in the west sixties of Manhattan has taken. A neglected residential neighborhood back of the New York Central freight yards was allowed to fall into bad repair. The tenements fronting on the streets filled up almost exclusively with negroes. Property adjoining became less desirable for residential purposes. Neglect of repairs made conditions worse. Then came the advent of the automobile and the need for garages and repair and service stations on cheap land. Garages began to invade the district. Then there commenced a movement to assemble large plottages, creating an active market for real estate almost irrespective of the condition of the buildings. This occasioned a general advance in the prices of real estate. Mounting interest charges and taxes put a heavy drain upon the owners, so that in turn less cash was available for maintenance. The effect upon the tenants was higher rents for buildings in worse repair. The effect upon the owners was higher paper value and a retarded market for industrial properties. Today many of the owners are still holding onto property on which the carrying charges exceed the rents, in the hope that a possible future Hudson River bridge in the neighborhood may boost the prices of their real estate. From the point of view of the city, the district has gone from bad to worse. The social and health problems of the neighborhood constitute a tax upon the whole city. So bad were the implications which were connected with the very name of the district, that the attempt has been made to drop the name of "San Juan Hill" and know it as "Columbus Hill." Meanwhile it is neither a residential nor a manufacturing and commercial district, and so far as its present state of development is concerned, it is undesirable from many points of view for either use.

Needs of Industry Vital. Surely it should be possible in any proposed amendment to the zoning law to take better cognizance of the needs of industry, and to set down definite regulations designed to benefit not only industry itself but the general good of the city. It benefits neither industry nor the city to simply write the words "Unrestricted Use" upon the zoning map. In the first place, it does not supply

the transportation and shipping needs of modernized industry to expect industry to grow by merely taking over undesirable districts originally laid out for residential needs. Blocks ranging from 600 to 900 feet long and only 200 feet in depth are likely to create difficult problems because of their shape, and when the long frontage is on a 60-foot street, the problem becomes well nigh insoluble. There is no reason why high prices should be paid for industry on streets which have never been intended for industrial use. In the second place, the prices which industry has been forced to pay for assemblages of plottage have given a speculative stimulus to land values. This has been felt both directly in high prices for industrial plottage and indirectly in high prices for all adjoining property available for housing purposes. As a result, the rents exacted of industrial workers living near the plants have been advanced, with resultant pressure for higher wages.

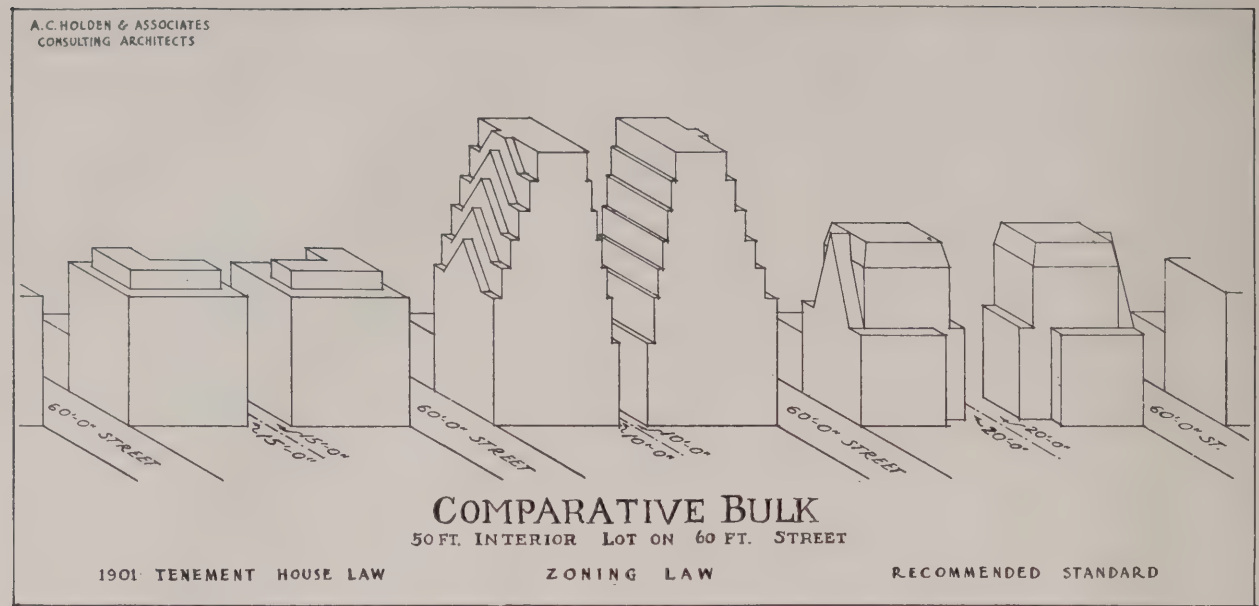
In the third place, in the search for cheaper homes, industrial workers have been forced into the outlying districts, with the necessity of long periods of travel daily upon expensive transportation systems. There are two primary objections to the long trip to and from work; one is the cost in time to the worker, for which industry pays in the lowered vitality of the worker; the other is the cost in cash which industry pays in the form of higher wages and higher taxes necessitated by the practice of subsidizing the construction and operating costs of transportation systems which are not self-supporting. It is the high rents exacted for old fashioned, sunless, undesirable homes convenient to work that are forcing migration to outlying districts and to the suburbs.

Effect Upon Transportation Problems. This movement has contributed more than any single cause to complicate our transportation problem. There has been much loose talk about the tendency of population to move away from Manhattan, and its desirability, but it is a physical as well as an economic impossibility to transport all of the workers required in an industrialized and commercialized Manhattan to and from the other boroughs both night and morning. The day is not far distant when mandatory provision will be made by the zoning law, restricting for residential purposes districts immediately adjoining areas where manufacturing and commercial and mercantile enterprises are carried on. Furthermore, assessments and taxation must be so equitably adjusted that the assessed values and the resulting taxes upon residential properties will not be disproportionate to the rents that can be charged. It must be borne in mind that land values established at a low level are essential if homes are to be rented at low rates. With the additional interior partitions necessary for privacy and the additional required plumbing, residential construction cost runs higher than the cost of construction for manufacturing and commercial uses. The rental market, however, except in the luxury class of homes, is directly the reverse. Here there is a clear case where it is



The peculiar geographical character of Manhattan Island has produced an uneven distribution of industry and housing. It is now practically certain that most of the older sections cannot properly be rebuilt for housing unless permanently restricted to residential use. This should not, however, prevent the use of the lower stories for stores or other uses essential to a residential neighborhood. On the accompanying map a preliminary attempt has been made to zone in such a way that residential areas are so distributed with relation to light and heavy industrial areas as to reduce congestion.

necessary for zoning regulations to set aside areas where residence values may become stabilized. It should not be necessary to argue here that such a policy will not work hardship upon the owners of



(a) The building is not permitted to cover more than 70 per cent of the area of the lot. Front wall may be $1\frac{1}{2}$ times as high as street is wide. Courts are of uniform height throughout. Pent houses may cover 50 per cent of roof area.

(b) The rear yard must be 10 per cent of the depth of the lot. In Manhattan Borough the front wall is in general allowed to be $1\frac{1}{2}$ times as high as the street is wide (in some districts to $1\frac{1}{4}$ times and in others $2\frac{1}{2}$ times).

(c) The rear yard must be 20 feet deep. The side walls may extend along the lot line for a depth of 60 feet only. Both front and side walls must set back 10 feet above the street height plus 5 feet.

property. It will tend to check the speculative exchange of land in certain sections, but the stabilization of the income should compensate for this.

A consistent zoning policy which includes the proper relation of residential and industrial zones will bring relief to the general problem of congestion. In the first place, the reservation of zones in which heavy traffic is not likely to originate in proximity to zones suffering from heavy traffic is in itself an immediate relief to the traffic pressure in the congested areas. This is of fundamental importance to industry. In the second place, it is no less important to dedicate definitely restricted localities permanently to housing. It is only through the incentive furnished by such a guarantee that improved residential areas of modern standard can be developed. New building in such areas, while perhaps only slightly reducing the population, will nevertheless tend to reduce congestion. Higher buildings with elevators and apartments planned two rooms deep, with garden courts and open spaces, will afford far more healthful accommodations than the present neglected tenement neighborhoods. Finally, every residential area preserved within walking distance of a mercantile, commercial, or manufacturing area reduces the congestion due to transportation, which is one of the worst manifestations of our problems.

The Hope of the Future. There is room of course for great difference of opinion as to what should be done to alleviate the effects of congestion as well as room for differences as to what is reasonably within the possible range of accomplishment. It is strange, however, that so little progress has been made toward getting at the root of the problem. If subway

trains are overcrowded the public shouts "build more subways"; if the streets are jammed with automobiles, the public asks for more policemen; if the situation gets worse there is a demand that the sidewalks be cut away and the roadways widened. If rents are high the public expects to have a law be passed setting everything right. The public hasn't the time or the desire to try to find out what is the matter.

The public is not mature enough, even the experts themselves are not yet mature enough, to know that expert advice is valueless unless balanced with an understanding of public need and public policy. In the great overgrown, over-balanced City of New York there is the need today for a great getting together of experts in order that those who are experts in their own line may at least get an understanding of the point of view and of the experience of the others. Our civilization has developed to such a point today that the directing forces have outgrown the mental concept of the individual. By the inter-relation of individuals of different training, however, the group concept can be carried much further, and the forces in our social system with which the individual alone is unable to cope may be controlled and directed by an intelligent group leadership. The solution of the problems will be dependent on such coöperation.

Perhaps the problem of the further development of city zoning ordinances is one of the foremost that has arisen to challenge the capacity of the individual expert. Bound up with it is the key to the current which sways the whole course of city growth and city life. It is not a problem which can be left with a bunch of theorists to be toyed with.

BUSINESS AND FINANCE

THE ARCHITECT AND BUILDING FINANCE

BY
C. STANLEY TAYLOR

THE interesting changes which have taken place in the practice of architecture within the past decade have established the profession in an economic position far more comprehensive and important than is at first realized. A very large proportion of the building activity of this country, now and in the years to come, takes on the nature of a business investment. This is obviously true in the case of structures which are built for the purpose of profitable resale or to return income on an investment. It has also become definitely true in the case of buildings that are constructed to house industrial and commercial enterprises. Factory buildings, warehouses and various types of commercial structures have become extremely important tools of industry. Their design and construction exercise a powerful influence on the profits of the businesses operated within them. If the buildings are inefficiently designed, it means that operation and handling costs may often mount to a figure which eliminates profit. If they are not well constructed, it means that maintenance and depreciation costs may so offset profits as to cause red ink figures in the annual statements.

Architecture's Advertising Value

Following the examples of leading industrial and commercial organizations, practically all business men are giving today much more serious consideration to the structures which they build for their own use. Accountants are introducing construction and building maintenance costs seriously into their figures. The appraisals of such enterprises made for purposes of financing through stock and bond issues give a prominent position to buildings as important assets of the business. In the same manner these buildings have taken their place in what might be termed the "institutional" advertising programs, particularly of the larger industries. Well designed structures are definitely featured as a part of their general newspaper and magazine advertising. Advantage is taken of strategic locations for the designing of factory buildings which will impress the passing public. Thus architecture is being gradually woven into the fabric of commerce and industry, assuming very important proportions as compared to its place but a few years ago.

The housing movement, which is carrying thousands of families into apartment buildings and apartment hotels, calls for architectural service which involves not only skillful and efficient planning, but the designing of exteriors which will attract the interest of tenants. Stores and shops, theaters,—in

fact almost all structures in which business enterprises of any nature are operated,—are demanding architectural design based on higher standards of business operation and of living environment. Even in the construction of modern homes, both small and large, this business aspect of architectural practice enters. There is a strong trend today on the part of the prospective home builder to give much thought to his investment. In days not long past the building of a house was more or less dissociated from business consideration. There was little thought given to resale or financing values. But today it has become recognized that the home is logically a part of one's estate, and often a very important part.

The Architect's Responsibilities

If, then, we take the term "building finance" in its broader meaning to include not only mortgage financing but also the sales or asset valuation of a structure, it becomes immediately apparent that the architect is a powerful factor in his business relationship with the investment. It is often within the power of the architect to establish the failure or success of a building in accordance with the plans he draws. His specifications will tell the story of reasonable or excessive maintenance and depreciation charges. His presentation of the project may have a powerful influence on its financing. It is for these reasons that every architect, even though his practice may be restricted to residential work, should give serious consideration to his place and his responsibility in relation to the owner's investment. An interesting fact is to be noted in studying the programs of many architectural organizations within the past few years. Almost without exception those offices which have been most successful are those offices in which there exists a definite measure of appreciation of the business aspects of the building projects entrusted to them. Conversely, we find organizations which have depended entirely on designing skill passing gradually out of the picture, while good, profitable work follows the line of least resistance from the practical point of view of the average business man. These statements do not mean that the architect must become completely businesslike in his administration, nor do they mean in any way a sacrifice of architectural integrity or belittling of good design. The ideal situation is to be found when the two elements are combined, to the end that structures of fine appearance and a high degree of efficiency of purpose may be created.

There are two ways in which the architect may establish and hold his contact with the important

function of building finance, or in other words, with the business side of any building project. The first way is to gain for himself through observation and study a general knowledge of the various elements which create successful financing and operation in the building field. The second way is to understand and appreciate the contribution which can be made by experts of various types who, in a consulting capacity, will assist in making plans successful. If we examine today a building which is undoubtedly achieving its purpose by operating successfully from the owner's point of view, we will almost always discover that a happy combination of brains and experience has been involved. We shall find either that the building was designed by an architect who has had sufficient experience in the type to know its business problems and to meet them successfully, or we shall find that either through the owner's or the architect's insistence someone has been brought in who could and did contribute the necessary knowledge of operation to establish the project in a successful manner.

The Architect's Business Position

Many architects probably do not realize that a few years ago,—perhaps 10 or 12 years back,—the profession went through a very serious and critical period. In a sense its ultimate place in the American business world hung in the balance. The question then was,—would the architect assume his rightful position in relation to building projects, or would he be but a hired designer, paid by owners and contractors to develop simply pictures in accordance with specific instructions? A great many of the larger architectural offices and also many of the smaller units in the profession responded in a most interesting way to this situation,—sufficiently to swing the scales in a most favorable manner. There are some who will question this statement and who will refuse to recognize that the profession ever faced such a critical situation. To these we can only suggest consideration of two or three important facts.

The Architect as Business Adviser

Almost all of the leading architectural offices today have a full appreciation of the business aspects of the projects on their boards. This is true even to the point of finding individuals, in many of these offices, whose sole work has to do with business administration,—not only of the office itself but of the projects of clients. There exists today a very close relationship between architects and bankers or other sources of mortgage loans and between architects and building managers, real estate experts and other types of consultants who contribute to the economic design of a structure. The architect today stands in a very different light in the eyes of the average business man. He is not only a designer but he is often recognized as a sound advisory source. The questions which are asked in the average architectural office today pertain much more to the business than to the

æsthetic requirements. These questions are broader in their range,—they delve into profit making or operating functions to a far greater degree than ever.

Cost Estimates and Finance

In connection with many types of building operations, the first requirement demanded of the architect is the preparation of sketch plans and outline specifications of such a nature that they may materially assist in financing. Very often this is not only ordinary senior financing but has to do with bond issues and other types of public financing on a large scale. It is very often the case that general financing agreements are required on large operations even before land is actually purchased. The architect's function here is to provide sketch plans which will show what kind of a building can be built on the particular site in question, and from which tentative operating and income schedules can be developed sufficiently to justify a preliminary financing commitment. At this point there enters one of the most important functions which the architect can possibly perform in connection with the financing of a building project. This is the function of preliminary cost estimating, and it is here that the architect's great responsibility begins, because at this point a countless number of building projects have been started in the wrong direction. Innumerable instances can be given where building committees have been misled by architects' optimism in regard to ultimate costs. Case after case can be cited where financing negotiations have fallen through because preliminary cost determinations were made in a vague or fallacious manner. To erroneous preliminary cost estimates there may be charged the loss of many a good project which has never passed the preliminary stages in the architect's office, because of a false start. It is to be remembered, after all, that most individual or committee administrations of a building project are being operated in a thoroughly practical manner by business men. Almost without exception, clients are willing to face facts if they are presented in a dependable and sincere manner. What clients do not like is to face facts after the actual operations are under way or nearly complete,—that is, if the facts prove original estimates to have been far too low.

Aspects of Preliminary Cost Figures

Careful observation of a great many building projects seems to prove that it is quite possible to make preliminary estimates which are not far from the ultimate truth. It does not matter if the building so developed is smaller than the client had hoped to obtain under his budget, nor does it matter if he cannot go into certain luxurious types of materials, finishes or equipment. What really does matter is that he shall know approximately what he can get for a given amount of money, or approximately what the building he wants will cost. He can change his ideas or increase his budget if he finds that it is necessary, but after he has plunged into the invest-

ment and is coming to the finishing stages, if he discovers a great discrepancy between the estimate and the actual cost, he often finds himself in very hot water. He finds that he cannot go back to his mortgage financing sources and increase his loan. He often has no additional capital of his own, nor can he obtain it. What then usually happens is one of two things. Either the project goes under foreclosure and is finished by someone else, or it becomes necessary to greatly cheapen the finishing and equipment of the building, which is very unfortunate. We have today many examples of well designed and well built structures which have been forced to cheapness in the finishing stages because of failure to properly estimate and budget building costs. Consequently, these buildings are operating under unnecessarily high maintenance costs and are suffering from a degree of visible depreciation and shoddiness which directly affects renting both in the size of the income and in the percentage of vacancies.

Here is a situation which often is charged to the architect's failure to obtain proper preliminary estimates,—and the charge is often fair, because this cost is perhaps unfortunately often a part of the architect's responsibility. Of course, it is not a direct financial responsibility, because the architect in no sense guarantees the cost of the building, but it is to be noted that where costs greatly exceed estimates, the client will hold this fact against the architect forever.

Reliable Cost Data Essential

This is not the place to discuss methods of estimating costs, particularly preliminary costs. Articles will appear from time to time in this section of THE ARCHITECTURAL FORUM covering this subject from a number of important practical angles. It is sufficient to say here that experience has proved that preliminary estimates of a fairly dependable nature may be had if sufficient care is exercised to determine costs by correct comparisons and through sound sources of information. Obviously, the architect should not shun a discussion of costs, nor should he in any way attempt to gracefully evade this subject. On the other hand, he should be the first to insist upon such a determination and the first to bring his client squarely face to face with this practical side of his project. We have never yet met a client who broke off relationship or indicated an unpleasant attitude because the architect brought him face to face with the truth before his money was in danger. We have seen thousands of cases of the reversed situation,—all of which proves that one of the most important relationships of the architect to this question of building finance is that of cost estimating.

Presentation of Preliminary Sketches

The actual physical presentation of sketch plans is highly important. The first impression which a

banker or an investor gains in relation to a new building project is regarding the location and general purpose of the building, but the most powerful impression he gains is its first visual interpretation, which, of course, must be from the sketch plans prepared by the architect. Owners themselves are not always aware of this fact, and the architect should clearly indicate to the owner the importance of proper presentation. Naturally, the larger the project or the more involved its financing, the more carefully should this presentation be made, and here again the architect plays an important role in building finance.

Thus far there has been no indication that the architect must become a past master of building finance. Of course, if he reaches a point where he establishes financial connections in which he can actually aid clients in obtaining building and mortgage loans or in the promotion of a project, it is obvious that he can benefit materially. On the other hand, if he will only discharge the functions which come naturally within the scope of his work, fitting them into the business needs of the project, he will have accomplished all that is necessary.

Specifications and Costs

In this connection we naturally come to a consideration of specifications. The selection of building materials and equipment is of tremendous importance in relation to the business success of the new building, as has already been indicated. The building field of today offers such a tremendous scope for selection that even in the less expensive types of construction it is quite possible to incorporate materials and equipment which will function in a manner consistent with successful operation. As buildings have assumed a more important position in the economic structure, it is but natural that their span of useful life should have been materially lengthened. Construction costs are so high and individual projects are often so large that short-term investments have become impossible in this field. At the same time, even as a chain is as strong only as its weakest link, so a building is only as good and will exist only as long as the poorest major materials and equipment which are incorporated in it. Consequently, the architect must become even to a greater degree than he is, an exponent of the use of good materials and equipment. He must be a demonstrator of the fallacy of cheapness in construction,—and all from the business point of view. This is another way in which he can render a tremendously valuable service in relation to building finance and make an equally valuable economic contribution.

If the architect of today will do these things in conjunction with good designing, he will not only fulfill his true function, but he will have discharged his responsibility to the owner in a manner which will earn many tangible rewards.

THE BUILDING SITUATION

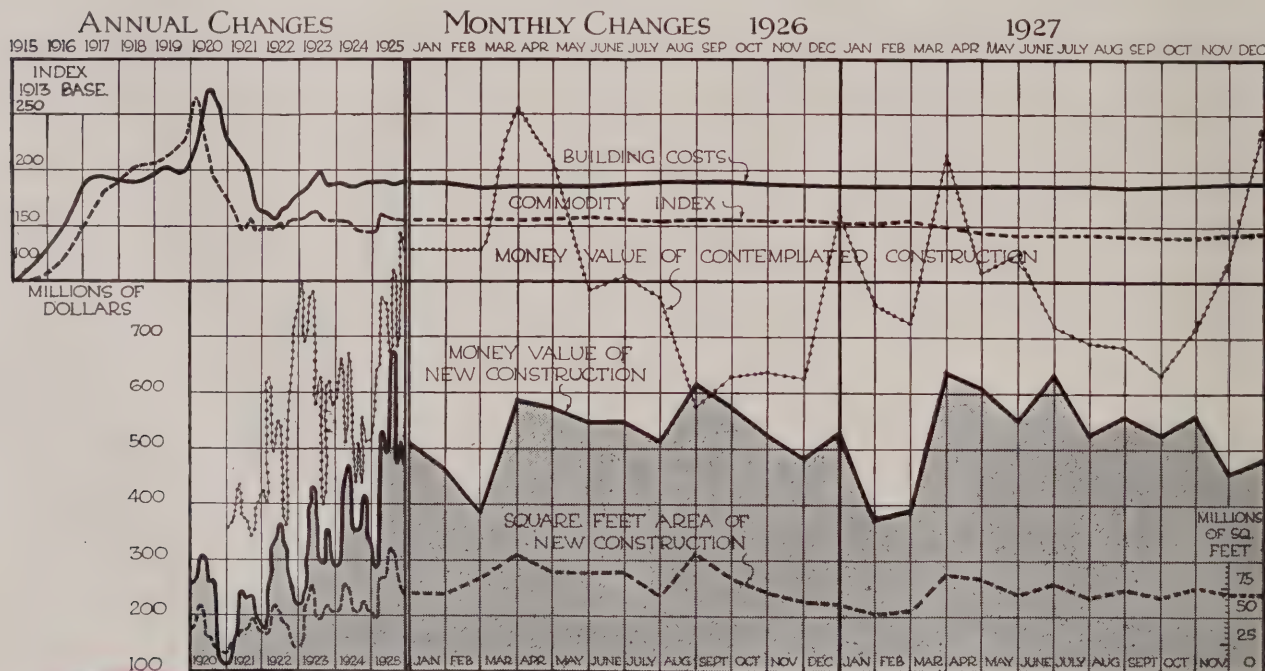
A MONTHLY REVIEW OF COSTS AND CONDITIONS

NOW that the figures are available for the year 1927, it is interesting to learn, according to the F. W. Dodge Corporation, that last year was the second best year in the construction industry. For the entire country the figures given for total 1927 construction are estimated at a little over \$6,800,000,000, which is about 30 per cent less than for the year 1926. The chart included here presents in graphic form the history of building activity since 1920. The years 1926 and 1927 are shown in monthly totals, both in money value and in physical volume of construction as measured by square feet of new floor area. One very interesting detail as indicated by the chart is that the month of December recorded a total plan filing of unusual proportions. The plans filed in the month of December indicate contemplated construction totaling \$988,915,100. These figures show a gain of 20 per cent over the amount reported in November, 1927, and 9 per cent over the amount reported in December of 1926. All indications point to a considerable volume of contract letting to take place early in the year 1928,—thus starting off the year as predicted in THE FORUM Forecast for 1928, which indicates a year at least as active as 1927, with totals perhaps slightly greater.

The contemplated construction is well worth ana-

lyzing to find out in what territories this early activity may be anticipated. The new work contemplated in New York state and northern New Jersey in December showed a gain of 68 per cent over the total of November, 1927, but a loss of 7 per cent from December, 1926. In the New England States there was a loss of 12 per cent from the amount reported in November, but a gain of 25 per cent over the corresponding month of last year. Evidently, there is to be greater building activity in the New England district in 1928 than during 1927. In the Middle Atlantic States there is shown an increase of 51 per cent over the amount reported in December, 1926, indicating a considerable increase in building activity. The Pittsburgh district showed somewhat less than in December, 1926. The Northwest shows a drop of 23 per cent from December of 1926. The Southeastern States show a drop of 11 per cent, and Texas a drop of 8 per cent. The year promises to be a good one for architects. In a great many offices there has been a slacking off over the ending period of the year, but the middle of January, when this review was written, already presented indications of renewed designing activity in most sections.

In many areas throughout the country there is evidently to be activity by speculative builders.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs*. This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index*. Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction*. Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record*. (4) *Money Value of New Construction*. Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction*. The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

ARCHITECTS, COSTS AND CONTRACTORS

BY

MORTON C. TUTTLE

PRESIDENT, MORTON C. TUTTLE CO., BOSTON

IT is commonly assumed, almost as an axiom, that the final cost of any building operation will of necessity be greater than the first estimates promise. This cost obviously concerns the buyer more than anyone else, yet the procedure conventionally followed in construction work may leave him with less control of his expenditures than anyone connected with his enterprise. He finds his function virtually reduced to that of trusting others and paying the bills which they present. He entrusts the investment of his building funds to those he believes more expert than he is in the technical problems involved. The basic cause of an owner's inability to control the cost of building is discoverable in the fact that the erection of any structure today involves complexities of design and equipment,—and hence the employment of a number and variety of specializing designers, contractors, and workmen such as were not dreamed of even 25 years ago. The immediate cause is attributable to a conservative disposition on the part even of able business men, which leads them to attempt to meet the complex building requirements of the present by the direct and simple means which sufficed a generation or more ago.

There are two important aspects to every construction design: first, the aspect of utility; second, the aspect of cost. Distinct though these are, their interrelations must never be lost sight of. An office building may be designed so as to satisfy every requirement of utility. Yet, if the cost of the finished building is excessive, the necessity for fixing rents high enough to insure an adequate return on the investment may disastrously reduce the tenancy of the accommodations offered. If mill, or warehouse, or factory represents excessive expenditure of capital, the inevitable overhead charges for the interest on the investment may seriously impair operating profits, or even reduce them to the vanishing point. Clearly, then, a design which has been drawn with theoretical utility primarily in mind, and without strict consideration of the cost of all the individual elements whose sum will constitute the total cost of the finished structure, must be viewed as essentially unsatisfactory. It is not sufficient to know that this design provides for a usable building. The scheme is not adequate if, by substituting other details and other materials for those specified, an equally excellent structure may be obtained in less time for less money. If cost is a vital concern, and if it must be controlled, then, obviously, someone fully competent in cost matters should be constantly in contact with every step in the development of any design whose fulfillment in structural form involves cost. Unfortunately, however, men who are competent to direct the designing and at the same time

to check the cost of each phase of its progress are extremely few. And the more the nature of the design is such as to appeal primarily to the designer's creative imagination, just so much the more are considerations of cost likely to be overlooked.

Protecting the Owner's Expenditure. It is fairly evident that the present procedure in undertaking a building operation of any magnitude is likely to involve an owner in avoidable expenditures, and to cause him eventual dissatisfaction or even keen disappointment. It is possible, however, for the owner to be so informed in advance as to the cost of developing each of several schemes that he may be able to proceed with complete assurance that the proposed undertaking will not require expenditures beyond those which, in the beginning, he has accepted as satisfactory and reasonable. This may be accomplished through the employment of an expert in construction costs, either a member of the architect's staff or a consulting expert. In either event such an expert will be a man of broad training, who has spent years in direct contact with actual building operations and who has devoted himself to calculating both the practical utility and the cost—in time, labor, and materials—of every element of building.

Complete Preliminary Estimates Necessary. Called into consultation at the inception of a building problem, such an architectural cost expert should be able, after consultation with the owner, to prepare a number of sketch plans of buildings of various types, any one of which would satisfy the general requirements outlined. He should be prepared, further, to render an accurate estimate of the cost of carrying out each of these plans, and to select the best for presentation to the owner with the estimate in sufficient detail so that the owner may judge, not only the probable cost of the whole, but the cost of each of the elements. Such an analyzed estimate makes it possible for the owner to weigh the importance of each feature in terms of its cost, and to retain this feature or to discard that, according to his judgment as to its relative dispensability. The plan thus generally outlined, estimated, and finally approved serves to establish a budget by which the detailed development of the design can be controlled. The cost expert should check every step in the progress of the work and safeguard against such departures from the plan as would increase the cost.

Architects who do not have trained cost experts in their own organizations find it advisable to have the collaboration of a consulting cost expert. They find that his services relieve them of a heavy load of responsibility, supply them at first hand with otherwise almost unobtainable practical information, and, by constantly and clearly defining the limits of

the creative endeavor, stimulate concentration upon the essentials of excellence in both structural and decorative design. Furthermore, in the end, a building plan developed in conformity with a preliminary budget, for whose application the cost expert is accountable, is pretty certain to present no necessity for those hasty and disfiguring last-minute modifications and eliminations which harrow the souls of all such designers as take worthy pride in their work. A concrete example is that of a library building which was completed with a saving of \$35,000 without sacrificing beauty of design, because of the collaboration of designer and cost expert.

It may be argued, at this point, that the cost expert is likely to insist on so reducing the design to its barest outlines that its character, beauty or effectiveness will be lost. The opposite may well be the case, as the savings suggested by the cost expert may easily go far toward making possible various elaborations calculated to enhance the attractiveness of the structure. If they do not, they will result in no further scaling down of purely decorative items than is properly demanded by the suitability of the building to the class of service which it is to render. Once final plans have been completed by the collaboration of designer and cost expert, they should be accompanied by an exact and accurate estimate of cost for every item of materials and labor which will enter into the building, together with an estimate of the time which should be allowed for completing each step in the building program.

Selecting the Contractor. The next step is the selection of the contractor best qualified to erect the building. The general contractor must possess a wide knowledge of material markets; he must know intimately the reputations of the sub-contractors in various lines; he must know the prices and the values of different classes of workmanship and different brands of materials. This knowledge of the general contractor may be used in either one of two ways, depending upon the form of business arrangement made with him. If he is put into competition with other contractors, his interest is to produce, at the lowest cost, a building which will pass inspection.

Competitive Bids. The theory governing the competitive method of selecting the general contractor is that this individual will, in so far as possible, safeguard his own interests, and that the architect or engineer will safeguard the interests of the owner. Here is a conflict of interests which is necessarily unfortunate. It sets the contractor on the watch for every possible flaw in the architect's specifications, and encourages him to make high charges for every departure from them which changes or enlarges the original plan. And, worst of all, it drives the contractor to do all his buying, both of materials and of sub-contract service, on the basis of *price* rather than of *value*. The general contractor, today, is by no means merely a kind of foreman mechanic who directs the work of his own employes. In the erection of a modern office build-

ing, for example, the general contractor's direct payrolls average hardly more than 15 per cent of the total cost of the structure. The remaining 85 per cent of this cost is absorbed in purchases from others—purchases which include rentals of machinery, materials, and labor through the medium of sub-contractors. To subject the general contractor to the pressure of competition is, therefore, to force him into making 85 per cent of his commitments in the cheapest available labor and materials markets. And this procedure inevitably relaxes his control over the quality of his purchases and over his method of making them. In the construction of an office building the services of some 30 different sub-contractors are employed and of a greater number of dealers in materials. Now, clearly, the facilities, or the skill, or the business ethics of no ten plumbing concerns will be quite the same,—or even equivalent. No ten different painting contractors will deliver equally satisfactory workmanship and supply equally reliable materials. One plastering concern will do a far better piece of plastering than almost any other in its locality. And in the business of building, as in other lines of business, the services of the expert are seldom obtainable at as low a figure as those of the incompetent.

It is poor policy to place a general contractor in a position where his knowledge and ability must be employed for the most part in safeguarding his own interests rather than those of his employer. Accordingly, he should be tentatively or fully engaged by the owner at the same time that the architect or engineer is employed. Under such circumstances it should be understood that he is to work *with* the architect,—concerning himself, first, with matters of cost, as they develop in the design proper; next, with purchasing; and lastly, with the conduct of construction. Thus engaged, the contractor will often be found to serve as a reliable cost expert, and in any event as so efficient a supervisor of costs that through his agency the owner may from first to last feel confident of controlling his expenditures. So long as the general contractor is not subjected to the pressure of competition, he can work in this way; but, as soon as competition is forced upon him, his interest shifts, and such knowledge as he possesses is reserved for his own protection, not for that of his employer. We submit therefore,—and here engineers and architects are pretty much in agreement,—that if competition is to be applied in building, it should be resorted to, not among the general contractors,—who are to be the buyers of plumbing, and painting, and steel work,—but directly among the plumbers and painters and steel men. Only in the latter case is it possible to appraise the real value of the service offered in relation to the prices asked, and to determine whether the proffered figure is really as attractive as it seems.

It may, of course, be argued at this point that the architect's specifications, by which contractor and sub-contractor alike are bound, will stipulate the

exact character of the work to be performed and the quality to be achieved; and that careful inspection should suffice to insure adequate fulfillment of these specifications. Anyone possessing a sense of humor might delight in following this optimistic theory in its application to a surgical operation, to the painting of a portrait, the composing of a piece of music, or even to the humble yet subtly exacting process of making an apple pie. In his inner consciousness, every intelligent person is aware that the one chance of obtaining good work is to entrust a task to the competent. Inspection offers no substitute for honesty and ability. Granting that the contractor has been employed as an agent and not as an enemy, he will, when plans are completed, proceed to gather the bids of sub-contractors and material dealers. He will submit these bids with his recommendations to the architect, who in turn, after consultation with the owner, will determine which proposals are the most satisfactory. This procedure will enable those in command to make selection, not solely on the basis of price, but on the basis of value to be expected.

It will be the contractor's responsibility to organize finally all the interrelated functions of the build-

ing undertaking, to set up his organization, to arrange time, material and labor schedules, and with the least possible delay to get the work under way. If he performs his task as he should, he will keep the architect and owner constantly and reliably informed of the progress of operations, from the standpoint of actual time and money expenditures in comparison with previously submitted schedules. If changes in plans are ordered, he will make the necessary revisions in his schedules, and advise as to their bearing upon original time and expense estimates.

Knowing from start to finish the progress of operations, the owner will find himself able to control every aspect of his undertaking through the ablest collaborators, and, as completion draws near, to plan with complete confidence on the utilization of the new construction. If the work develops savings over the estimates, it is to his advantage; if conditions arise which necessitate expansions or other considerable alterations in the original plan, he pays only what these cost and with a full understanding of the situation. And in the end there will be delivered to him precisely the kind of building which he looked forward to owning.



Photo. P. J. Weber

Administration Building, Central Maine Power Co., Augusta

Joseph D. Leland & Company, Architects

A Building Erected by the Morton C. Tuttle Co. Under the System Outlined in This Article



WILLIAM J. SAYWARD

WILLIAM J. SAYWARD was born in Woodstock, Vt., in 1875. Whatever he may have been when he first descended the rugged slopes of the old Green Mountains, whatever grimness or dourness of that forbidding soil may have adhered, today we know him, after he has enjoyed 14 years of Georgia sunshine, as a pleasant, genial man,—a man not self-seeking; as enduringly dependable as the granite of his native hills; a man so rigorously fair-minded that he has been known to regret the salary he asked and received from his first employer, because he “couldn’t have been worth it.” He was graduated in civil engineering from the University of Vermont in 1897, and in architecture from the Massachusetts Institute of Technology in 1901. His early training was gained in the office of McKim, Mead & White, where he remained until 1908, leaving them to study in Europe. On his return he was, until 1913, a member of the firm of Wilcox & Sayward of Seattle. In 1913 he came to Atlanta to form with Mr. Edwards the present firm of Edwards & Sayward. There is not space allotted to make a comprehensive list of the work of this active firm, but the Girls’ Senior High School of Atlanta, the Columbia Seminary buildings at Decatur, Ga., and the auditorium building of the University of Florida can be mentioned as typical.

Mr. Sayward has taken a very active part in the development of the North Georgia Chapter of the American Institute of Architects, of which he was president in 1917 and 1918. He is now regional director for the Southeastern States of the A. I. A., and was elected a Fellow of the Institute in 1926.

HAL. F. HENTZ.



HAL F. HENTZ

NO firm of architects in the South has done more to advance taste in architectural design than has that of which the subject of this sketch is the senior member. Born in Florida in 1884, Mr. Hentz received his early training in the schools of that state. Naturally his collegiate course was undertaken in a Southern institution, Emory University, in Georgia. For his professional course, however, his eyes turned to Columbia and from there on to Paris, where he spent 1908 in the Atelier Julien. His early professional experience was gained in the office of Kirby, Petit & Greene of New York.

It was in Columbia, however, that acquaintances were formed which were to ripen into the partnership of later years. The partnership of Hentz & Reid was established in 1909, the two young men returning to the South where they opened an office at Macon, Ga. At this time, the dean of architectural practice in the immediate section was G. L. Norman, of Atlanta, who became attracted by the capacity of the young firm, and an alliance was formed under the name of Norman, Hentz & Reid. Upon the death of Mr. Norman the former firm name was resumed, but this was soon enlarged to include Rudolph S. Adler. As Hentz, Reid & Adler, the firm’s practice increased in size and character. The death of Mr. Reid in 1927 caused a further readjustment of the firm as Hentz, Adler & Schutze. Mr. Hentz’ personal qualities and ideals have compelled the recognition of his fellows so that he has twice been called upon to serve as president of the Georgia Chapter, A. I. A., which office he now holds.

WILLIAM J. SAYWARD.

THE ORGANIZATION AND PROCEDURE OF ALLIED ARCHITECTS

THE ALLIED ARCHITECTS ASSOCIATION OF LOS ANGELES

BY
EDWIN BERGSTROM, PRESIDENT

Editor's Note. In ever-increasing numbers we find public buildings and others designed by the "Allied Architects" or the "Associated Architects." The interest evoked by the results achieved naturally has a corollary in the curiosity in regard to the organization and procedure of the associations. Architects generally have evinced interest in this form of architectural organization, and public spirited leaders have seen in them an opportunity for service. New associations are being formed, and there is a likelihood of still further steps in this direction.

We are privileged to give in some detail the salient features of one of the most successful organizations of this kind, the Allied Architects Association of Los Angeles. We plan to present in a later issue the correspondingly interesting features of several other outstanding organizations.

THE Allied Architects Association of Los Angeles was founded nearly seven years ago by 32 licensed architects associating for the purpose of providing architectural service for buildings built with the proceeds of public tax money.

The plan, the idea, the ideal of this organization were perhaps best expressed in the statement published by the Board of Directors in July, 1921:

"These architects believe that they can subordinate and submerge their individual interests, to the end that they shall collectively as allies and co-workers offer the civil authorities a method of securing the best of architecture in public structures at no greater cost to those authorities for their collective services than would be paid to an individual architect, and with the utmost assurance that the buildings would be built for the least possible cost.

"The idea is to give collective service,—the ideal is to achieve thereby an adequate expression of the art of architecture in our public structures. The idea and the ideal are expressed in the by-laws of the Association: 'The paramount purposes of this Association are to advance the art of architecture, and by the professional coöperation and collaboration of all its members to secure for and to provide municipal, county, state and national governments with the highest and best expression of the art of architecture in the designing, planning and construction of public buildings, structures and improvements and at the least possible cost. It is not intended that this Association shall accept or perform architectural services for private individuals, firms, or corporations; but this shall not be deemed to prevent the Association from rendering such services to its members.'

Rights of Members. "The Association has planned broadly. It has its own drafting, engineering and superintendent forces, its own offices, and its own entity throughout. As an Association it has no capital stock; the rights, interests, privileges and liabilities of every member are equal, and no member can have or acquire a greater interest therein, nor be subject to a greater liability, than any other member. A member is without interest in the assets of the Association other than that conferred by his

membership; on termination of membership for any reason, all rights and interests of the member in the assets of the Association cease. Any gains the organization may make will be principally expended in those things that will be of aid to all architects in their professional duties, such as a comprehensive architectural library, meeting rooms and educational facilities for draftsmen. It is intended that only the most nominal gains will accrue to the membership; hence, a membership is attractive and will be confined to those architects only who are in sympathy with the idea of this Association and the opportunity it offers to give public service, and who have achieved the qualifications for membership. The by-laws so express this point: 'Any architect who, because of his ability and qualifications has advanced the art and profession of architecture and is especially fitted to render professional services for public welfare, is eligible as a member of this Association.'

"The membership is open to those individual architects who have achieved these high qualifications; by application to and approval of the Board of Directors and 90 per cent of the entire membership, such an architect becomes a member of this organization and, as evidence of such election, the certificate of the Association is issued to him. The membership is safeguarded from those who fail to fulfill the loyal service demanded or who find the work irksome or not to their taste; a membership can be terminated (a) by resignation of the member, (b) because of dereliction of duty to the Association or other cause by a vote of 75 per cent of the members, or (c) for any reason, by a vote of 90 per cent.

"The cost of membership has been put at the nominal fee of \$100; this has been fixed in the charter of the Association, so that the entrance of any architect to the Association will not be barred by its cost. The Association desires the personal services of its members, not their money. The members will be compensated for their services to the Association.

Duties of Members. "It is not expected that the duties of the members will be onerous, but there are no qualifications in this respect. Every member has signed this document on the books of the Association: 'I hereby acknowledge that I have read the Articles of Incorporation and the by-laws of this Association, and I do promise and agree that I will comply with and uphold the principles and aims of this Association as expressed in them. I further promise and agree that I will render promptly, diligently and faithfully to the Association such personal service as may be assigned to me by the Board of Directors, and for the compensation, if any, allowed by them, and will endeavor, to the best of my ability, to work harmoniously and unselfishly with my fellow members of this Association.'



Los Angeles Hall of Justice

The Allied Architects Association of Los Angeles, Architects

The Control and Administration. "The business and the property of the Association are conducted, managed and controlled by the Board of Directors. Those first elected were:

OCTAVIUS MORGAN	REGINALD JOHNSON
EDWIN BERGSTROM	DAVID C. ALLISON
MYRON HUNT	

The officers first elected were:

OCTAVIUS MORGAN	President
EDWIN BERGSTROM	1st Vice-president
DAVID C. ALLISON	2nd Vice-president
H. M. PATTERSON	Treasurer
J. J. BACKUS	Secretary

Both directors and officers are subject to immediate removal for neglect of duty or other causes.

"The administration of the work of the Association and the operation of its departments are in accordance with the most efficient and economical practice; its chief divergence from the ordinary practice is its machinery for securing the collective criticism and service of its members. The talented designers, those men who have really been educated to know and understand the good things in architecture and to express them, those men who too infrequently have the opportunity to function on public work, will be afforded the opportunity by this Association, and the member whose qualifications most fit him for the work in hand will function most strongly on that work, and every member will contribute his ability to the work of the Association under the direction of the Board of Directors.

"The practical sides of the undertaking, as well as the æsthetic, are fully cared for; the Association gives its most experienced minds to exercise the business and executive functions and to care for the structural, mechanical, electrical, architectural, sanitary and supervising problems. Its carefully selected and rounded out membership gives, in every branch of architectural work, a collective service that no private individual, firm or corporation can buy.

"The individualistic touch is necessary to all architecture and to every art; without it there is no life or interest. So in this association, this touch can never be lost, because the method of organization under which it operates provides that some individual member will always have the architectural expression of the problem, under and subject to the criticism of his co-workers.

"The Board of Directors shall have power to enter into contracts, acquire and assume obligations and to borrow money, make or issue notes, bills or evidences of indebtedness in the manner provided by law. The Board of Directors shall have full power and authority to require members to perform services assigned to them by said board and upon the failure, refusal or neglect of any member to perform the same, said board shall have power, upon being directed so to do by a vote of three-fourths of all the members expressed by letter ballot, to forfeit all interests and rights of such member in said Association.

Compensation of Directors. "There shall be no compensation paid to any director for attendance at any meeting of the board or of the members.

Power to Fix Compensation. "The directors shall have the power and authority; and it shall be their duty, to fix the compensation to be paid to members of the Association for their individual services rendered to the Association, and to fix the compensation to be paid to its officers, representatives and employees.

Division and Application of Profits. "Profits acquired by the Association shall be divided in the month of January of each year among the members whose membership has been continuous for a period of one year prior to the date of said division and shall be deemed to be the amount of funds determined by the Board of Directors as available for division after all expenses of the Association have been paid, including payments to members for services rendered and amounts not required for conducting the affairs of the Association. Every member signs a waiver of all his rights to the Association."

Reasons for the Form of Organization. The architects organizing the Association were all members of the American Institute of Architects. The doing of this work in this manner was discussed in chapter and committees. It was found entirely impractical to do the kind of work that it seemed best to do through the chapter organization of the Institute. The service of members to the chapter is compulsory because of membership therein; the services ren-

dered by members to the Association are entirely voluntary;—the chapter executives are ever-changing; the responsibilities of the practice of architecture require unchanging executives;—the chapter is a branch of a national body and therefore is not an organization organized for profits or one that can assume the responsibilities and liabilities of a business organization. If the chapter should assume business obligations, the Institute would become involved in its financial problem without doubt, and thereby would be created a situation impossible for the Institute. The Allied Architects Association organization is incorporated under the laws of California. The indebtedness which the Association may incur is limited in the by-laws to \$20,000.

Avoiding Pitfalls. In the organization care was taken to avoid some of the pitfalls that seemed to have caused other altruistic associations of architects to fail. The organizers studied carefully all available data regarding several of these attempts and visited several of the localities where attempts had been made to render collective architectural services. How well the present organization has avoided these causes of failure is evidenced by the fact that this organization has been functioning for six and one-half years, has completed some very important commissions, has continuing contracts for several years to come, and has the continued enthusiastic interest of its members.

Fees, and Payments on Contracts. The organization gives its combined services for a single fee and performs its work through its own complete organization down to the very last detail of practice. Its contracts have been based on a 6 per cent fee, modified by the extent of the services rendered, and in all respects have been exceptionally fair and equitable contracts for architectural services for public buildings. The contracts provide and complete preliminary sketches (which, when accepted by the public body, can be deviated from only as the development of the working drawing compels modifications or as the public body may by resolution require); the preparation of the working drawings and specifications; the preparation of the contract documents and the construction contracts; bonds and insurance instruments; and the supervision and superintendence of the work. Payments to the architects become due as the services of the architects progress, and are payable monthly beginning with the performance of service, the amount due being based on preliminary estimates of the cost of the building, fixed by the public body, until such time as the actual costs of the building are determined, when any necessary adjustments in fee are made. The contracts provide for various additional services that may be rendered by the architects in addition to those on which the basic fee is computed and an equitable charge therefore in addition to the basic fee.

Procedure in Actual Work. The functioning of the organization has really been very simple. The Board of Directors, after signing a contract for a



Patriotic Hall of Los Angeles

The Allied Architects Association of Los Angeles, Architects

project, sends a written statement to the members outlining the requirements of the building as fixed by the public body, and requesting each member to submit at an open meeting of the Association, in any manner he desires, his ideas of the proper solution of this problem. The various suggestions and sketches submitted by the members are thoroughly discussed at meetings of all members, at which the public officials are always present. Often the discussions, in which the officials take part, run over three or four such meetings. It has been easy for the members and officials by this open discussion to arrive at two or three possible solutions of the problem, any one of which might be proper. These two or three tentative solutions have then been returned to each of the members, asking them again for their criticisms and suggestions. These are re-assembled, and again at open meetings these second offerings are considered and out of the discussion of these, always with the public officials present, there has been no difficulty in selecting the *parti*. When this scheme has thus been decided by the members and officials, the Board of Directors appoints one of the members to take personal charge of the design and the working out of the *parti* into a final design. The board criticises the design as it grows, and also appoints a small number of its members as a jury of design. The board selects for both designer and the jury, those members who, in its judgment can best solve the particular problem in sympathy with the general solution decided upon by the membership. Thus the final *parti* is worked out of many sugges-



Hollywood Bowl

Allied Architects Association of Los Angeles, Architects

tions offered by the members and is the result of many full and free criticisms of them by the entire membership and the public officials. The development of the selected solution is placed in the hands of the men most competent to develop the particular *parti*, whether or not he may have submitted the approved scheme, and associated with him are those members who will work sympathetically. The Association has found, and the designers admit, that the designer has invariably profited by the sympathetic criticism of his jury and in the final design there is no question but that the individuality of the designer has been preserved and that the design has gained by the jury criticism.

As the design is developed by the designer, the drawings are brought up one or more times before a general meeting of the members and officials to be freely criticised, and as a final step they are brought to the Board of Directors and must receive its criticism and approval before they receive the stamp of the Association as the final design and final solution. All work of drafting and preparing of documents is done in the drafting room and offices of the Association by its own staff. No work is apportioned out to any member. The designer and the jury invariably develop the design in the drafting rooms of the Association. For the development of the working drawings, further juries of the members are brought into active work. There is a permanent jury of engineering and a permanent jury of specifications whose duty it is to meet with the designer and jury of design and discuss and fix upon the construction and materials and to criticise the development of the structural drawings and the preparation of the specifications, and finally, after the designer has approved

them, to approve them in writing to the board whose final approval must be had.

Supervision. Responsibility for the direct supervision of the work of construction is always maintained in the Board of Directors, which delegates one of its members to supervise a project, and this member and the designer and the chairman of the jury of construction and specifications meet regularly at the building for inspecting purposes and to give directions to the general superintendent of the Association who is in direct charge of the field work for the Association. The final acceptance of work of construction is on the signatures of these members.

Office Methods. The offices and drafting room of the Association are organized to give complete service, the drafting room carrying its own sanitary, electrical, mechanical and acoustical engineers. The Association calls in as advisers on special problems the best outside talent available.

The general office of the Association has been fully organized, and the accounting department has developed very valuable and exhaustive forms whereby the costs of doing work have been established down to the finest details for the purposes of record and efficiency. The general office, in consultation with various counsel, has developed full and complete contract agreements for the use of contractors and public bodies on public buildings, which are receiving wide application because of their full detail requirements. Approximately 200 forms have been worked out and are in use by the Association in connection with its work, and these forms are invaluable.

Budget. As soon as a project is contracted for by the Association, the board prepares a budget for the work wherein it distributes the probable amount



Preliminary Study, Acute Unit of the Los Angeles County General Hospital
Allied Architects Association of Los Angeles, Architects

of the fee to reserve, preliminary work, working drawings, supervision and superintendence, and general expenses. The limits of the expenditures set by this budget for the development of the various portions of the work control the drafting and other costs.

Payment of Members. The profits distributed to the members as such have been very nominal, amounting in the aggregate to approximately the amount of the membership fee. The payment of the members for services has been on an hourly basis at a rate which has been established by the Board of Directors, the rate being the same for every member. The number of hours of service given by each member is kept by the Association, and the total amount of compensation received by the member for any service performed by him for the Association, whether it be on the architectural or engineering problems or on the development work of the Association, and also the spending its reserve, are determined by the Board of Directors by fixing the number of hours.

Political and Legal Difficulties. The Association, functioning on public work, is subject to political attack at all times, and like any association, must expect to have its motives questioned, its compensation questioned, and its legality in service assailed. The Los Angeles Association has been the subject of violent political attack, culminating in 1926 in forcing the Attorney General of the State of California to bring *quo warranto* proceedings against it asserting that its organization was illegal, that it was illegally performing architectural services, and that the service which it was performing could be performed by individuals only, seeking to enjoin it from performing further services, and the County

of Los Angeles from making further payments under its contracts. These proceedings were heard in the Superior Court and injunction denied without leave to amend. The decision was appealed to the Supreme Court of California, and in July, 1927 a unanimous opinion of the Supreme Court written by the Chief Justice upheld in every particular the decision of the Superior Court and set out that the Association was legally incorporated and as an Association could render full and complete architectural services so long as its members were licensed architects under the laws of California. The legal status and responsibilities of the Association were thus finally established by the highest court authority, and the decision was far-reaching in its effects upon the question of associations of architects, whether of two or 50, and incorporations of architects performing architectural services. The litigation has been long and costly to the Association, but it has borne the expense because it felt that the question should be settled as to the responsibility and qualifications of associations and incorporations to perform architectural services, and because it felt that the service it was rendering to the public was of such importance that it should be continued if possible.

Results of the Work. The gains which the Association has obtained by its business have been entirely expended for the betterment of the architectural profession and for the development in the community of an appreciation of architectural service and architectural design. This has been done in many ways, and two of its most lasting of efforts will be the encouragement it has given to architectural education in the local colleges and appreciation of design in the schools and the development of an architectural

library open to the public under charge of competent librarians.

The work which the Association has done in these years includes:

(1) Giving advice regarding various public works and enterprises, such as the Los Angeles Coliseum, restoration of the San Fernando Mission, and architectural features of the Los Angeles city viaducts.

(2) Forming for the City and County of Los Angeles a plan and scheme for development of an administration center.

(3) Work on the exterior of the Hall of Justice; Los Angeles Museum of History, Science and Art; Patriotic Hall; acute unit of the Los Angeles County General Hospital; acute unit of the Olive View Sanitarium; three playground buildings for the Playground Department of the City of Los Angeles; and development of the Hollywood Bowl.

Complete preliminary sketches, working drawings, plans and specifications have been prepared for all of the buildings and structures itemized under (3).

The essentials of the success of a similar enterprise based on the experiences of this Association would seem to be these:

First. The rendering of public service in order to achieve better public buildings must be constantly adhered to and upheld as the paramount purpose of the organization. It is essential that the organization must be kept altruistic in its nature and that the members must always have the feeling that they are giving something to public service and giving more than they are being compensated for.

Second. The work of the Association must be limited strictly to public work in order that the private practice of a member shall not be infringed upon. An Association would have no excuse for functioning if the public work in its locality were being adequately done or if its objects were to cut

out competition, or if it were necessary for it to engage in the usual political maneuverings to obtain its work. The Association, an association, to perform public service, must be politically above criticism.

Third. Every member must be paid for the time he puts into the organization, regardless of what the rate of compensation may be, and each member must be paid at the same rate as every other member, regardless of his ability, in order that the equality of his rights as partner may be unquestioned.

Fourth. The organization must be made representative of all abilities and qualifications, so that at some time or other every member will be able to contribute something to its success.

Fifth. Frequent meetings must be held to discuss all details of the work and problems in hand so that each partner will be kept personally interested.

Sixth. The actual work must never be apportioned out to members; complete architectural organization must be kept and maintained during the progress.

Seventh. As the objective of the organization is to provide better public architecture, it cannot be an organization for individual profit to its members; and the expenditure of any surplus funds the organization may accumulate must be made so as to accrue to benefit the architectural profession as a whole. In this case profits are being expended, first, on the building up of a working library of fine arts; second, in a development of fine arts educational system in southern California and the founding of scholarships; third, a development of public appreciation of the arts of design and architecture.

Eighth. Each member must voluntarily relinquish any interest that his estate might have in the assets of the organization, insofar as he can legally do so, and request that any such assets that have accumulated to him shall accrue to the benefit of the Association as a whole.



Los Angeles Playground Building

Allied Architects Association of Los Angeles, Architects

THE ALLIED ARCHITECTS ASSOCIATION OF COLUMBUS, LTD.

BY
W. A. PAINE

THE Allied Architects Association of Columbus, Ltd., was formed in February, 1924. The office of the Association is located in Columbus, O. The purpose of this Association is to provide by professional coöperation and collaboration architectural services for the design and construction of a city hall for Columbus and for such other public buildings and improvements in Columbus and Franklin County, paid for by the proceeds of taxation, as because of their civic importance seem to merit the efforts of a group of architects, and to perform such architectural service in a manner to advance the art of architecture and to contribute to the public good.

In the latter part of the year 1923 the City Council of Columbus requested the Columbus Chapter of the American Institute of Architects to advise it as to how to proceed in securing the best

architectural service for the proposed new city hall. A committee from the Chapter was appointed to take up this matter and make recommendations. Various possibilities were presented, among them being an association of architects who would work together in an effort to give the city the benefit of the combined talent of the architects of Columbus. This suggestion was favorably received by the Council, and the Chapter proceeded to form the organization known as the Allied Architects Association of Columbus, Ltd. Opportunity was given all practicing architects in Columbus and Franklin County, whether or not belonging to the American Institute of Architects, to make application for membership in the new organization, and the project was thoroughly discussed at an open meeting of the Chapter to which all architects of Columbus



City Hall, Columbus, O.

The Allied Architects Association of Columbus, Ltd., Architects

were invited. Under the Ohio laws, an incorporation was found impossible, and a partnership association limited by statute to 25 members was adopted as the best method of organization. A nucleus of 12 members was elected at a Chapter meeting, and these members elected the remaining 13 from among those who had made application for membership.

The amount of capital stock subscribed by each member was fixed at \$200, making a total of \$5,000. The affairs of the organization have been conducted by a board of five managers, elected by the membership. The board elects its own officers, consisting of president, vice-president, secretary and treasurer. Since the specific purpose of the Association, as set forth in its by-laws, was to provide architectural service for a new city hall, as authorized by the City Council, and for other public buildings paid for by the proceeds of taxation, no effort has been made to obtain work or publicity. The design of those buildings already undertaken has been determined by a paid competition among the members, the winner being appointed to act as chairman of the committee on design, with compensation determined by the board of managers. The board of managers organized its own office, selecting a production manager, a stenographer and draftsmen. Careful supervision is had by the board over all work in the office, and board meetings are held regularly each week, at which all matters requiring its attention are acted upon. An executive committee, consisting of two members of the board, passes on matters which do not require the action of the full board. Special work is assigned to different members of the Association, when occasion arises. All special work receives remuneration fixed by the board of managers. The by-laws, however, stipulate that the members of the board are not to receive compensation for attendance at the meetings of the board.

The standard form of contract of the American Institute of Architects is used, and the usual fees of 5 and 6 per cent are charged, depending on the size of the building involved. When separate contracts are let, an additional fee of $2\frac{1}{2}$ per cent is charged. On large buildings the contract calls for a clerk of the works to be employed by the owner. Each year a certified public accountant examines the books of the Association and makes a written report. The bookkeeping is of a simple character, but careful cost records are kept for each project. As provided in the by-laws, any and all profits derived from the conducting of the business of the Association may be divided among the members at such times and in such amounts as the board of managers may see fit and arrange for, and the board may divide and apportion parts of such profits among persons other than members for valuable considerations or for reasons that may be deemed sufficient by said board of managers, subject to the approval of a majority of the members. So far it has not seemed desirable to divide any of the profits among the members beyond the payment regularly each

year of 6 per cent on the stock and the payment of a special extra dividend of 100 per cent on the stock at the end of the third year.

The Association holds itself in readiness to serve the city of Columbus in every way possible. In some cases advice and suggestions involving some expense have been furnished without charge, as a matter of civic interest. A substantial contribution has been made to the Lake Forest Scholarship Fund for students of architecture and landscape architecture. The legal responsibilities of the Association are those placed by the law of the state of Ohio on partnerships doing business in the state. The commissions awarded to the Association are: Cleveland Avenue Fire Engine House, cost \$29,000, completed in 1925; City Hall, cost \$1,200,000, to be completed early in 1928; Sub-station, cost \$16,500, completed in 1927; Public Safety Building, estimated cost \$900,000; and the Northmoor Fire Engine House, estimated cost \$25,000.

So far all of the work of the Association has been successful. It is perhaps too early to claim complete success, because the city is only part way through a building program. Public work is often attended by difficulties and delays caused by lack of funds, and Columbus is no exception to the rule. Gradually, however, difficulties are being ironed out.

The advantages of an Allied Architects Association as they are seen here are: (a) The development of the ideas of a number of architects on any given problem by holding a competition for the project. (b) The interchange of suggestions, both as to design and in regard to practical matters of construction, engineering and mechanical equipment. (c) The confidence inspired in city officials and the public by the sincere and harmonious collaboration of a group of professional men on public buildings. (d) The personal pleasure and interest that each member of such a group obtains from working together. (e) The potential benefit that may be rendered to the community, not only by the high character of the actual service given in the production of well planned and well designed public buildings, but also by the application of any gains made by the organization to the advancement of architectural education and the increase of appreciation of good architecture.

Certain disadvantages of this form of organization have been cited by its opponents:

(a) It deprives the privately conducted offices of work that they might otherwise obtain.

(b) The work done by a group of architects loses the individual character that would be given to it if designed by one architect or firm of architects.

(c) There is difficulty in holding the interest of all the members of so large a group.

These disadvantages assume greater or less importance depending on the conditions under which the group operates and the type of men composing its membership. The Columbus "Allied" believes that these objections do not obtain to any great extent in its organization.

SUPERVISING THE SANITARY INSTALLATION

BY

A. R. McGONEGAL

MEMBER AMERICAN SOCIETY OF SANITARY ENGINEERS

TIME was when a plumber was an artisan in more than the sense of being a worker at the business of installing pipes to carry in the water supply and to carry waste and sewage out. Much of this work was in lead, as his trade name indicates, and he made his own traps, flanges and sometimes pipe, cast his tacks or fastening plates, made his solder, took great pains with his wiped joints, and generally prided himself on his handiwork of the trade. An order to such a man to install plumbing in a house carried with it assurance of work well done. Specifications, minutely detailing the work in hand and the results expected, were not necessary. He made his own specifications as he went along, and when the work was finished it represented his level best,—a monument to his ability and artistry as a craftsman. And he built his business on his reputation for good work and fair dealing, and not on his ability to submit low estimates!

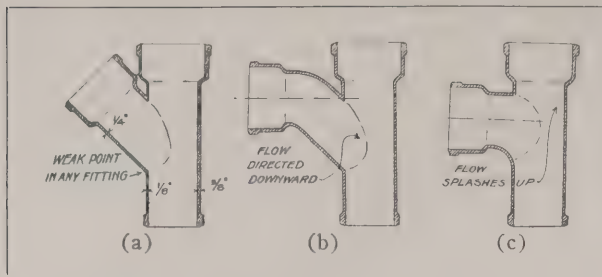
There is, however, another side to the picture. The symmetrically installed lead pipes, sturdily fixed in place, embellished with immaculate blacked and silver-wiped solder joints, all too frequently constituted a menace to the health and longevity of the householder. Perhaps not so much in the country and sparsely settled districts, but certainly so in the crowded sections of a great city. The journeyman or master in lead was not always a journeyman or master in sanitation. While lead was long used for underground water supplies, it was rarely used for drains, they being generally of brick, stone or tile. It is only just beyond the memory of men now living that cast iron pipes began to be used for drainage purposes, and, after proving their worth for several years underground, then for vertical lines outside and inside buildings, practically limiting lead to branch lines.

Prior to the early years of the nineteenth century, what we may call plumbing was a ground floor proposition, and mostly out of the house proper, so that lack of ventilation, loss of a trap seal, a by-pass here and there, and other sins against sanitation were not of very great moment; but with the advent of cast iron pipe came plumbing fixtures within the house and above the ground floor, and adherence to sanitary principles was a necessity. At first the fixtures were inside and the pipe was run outside, but even then it was seen that the pipe must be open at the top in order to prevent syphonage of the trap seals, and to avoid odors the open pipe was extended above the eaves of the roof. All plumbers did not carry the pipe up, some claiming it unnecessary, and out of the complaints as to variance in trade practice was born the first plumbing regulation. It was first enforced by the "guilds," as the plumbers' associations

or unions were then known, and later by the health officers, and it is today one of the five cardinal points on which all plumbing regulations are built and enforced by our plumbing inspectors.

The Plumbing Contractor and Low Bids. The entry into the plumbing field of cast iron pipes, and later of rolled and welded pipes, has had the effect of gradually eliminating the artisan from the business and supplanting him with fitters. The use of such pipes and stock fittings naturally tends to standardization, and the necessity for and enforcement of plumbing rules also lead to the same end, so that as the need for artistry in workmanship disappeared, skill in designing, ability to direct workers, ingenuity in saving space and labor, and similar talents became of moment. These attributes, together with buying ability, business system and financial resources, are what should be the only reasons for difference in bids today. Unfortunately, much of the material used in plumbing work, especially the hidden portion, is costly as to the metal itself or else it is used in such quantity as to be costly in the aggregate. Generally speaking, the base material costs all manufacturers the same,—the potters' or moulders' organization sees that the unit labor cost is the same, and delivery costs are pretty much alike, so that any sales advantage must be carved out of business overhead and dividends. This leads to paring weights down so that the weight used is the minimum instead of an average, as it should be, and advantage is had in saving in total tonnage output; to the substitution of more of a cheaper metal in alloys; to thinning down castings and even bearing surfaces; and generally cheapening the basic materials a plumber works with, through a fault in the system of supply and demand, of which he has only a hazy idea.

If pipe of a certain stock pattern will cut and calk or thread well and is acceptable to the city inspector, why should the plumbing contractor be interested if the pipe averages 3 per cent short of regulation weight, provided he can buy it a cent a foot cheaper in carload lots than he can some other make? If the stuffing box on one valve is much smaller than on another and it is \$100 cheaper for the lot, the price is the important point, as the work will be completed and turned over to the owner before the valve needs repacking or repair. Then, too, much of the material on a large project is purchased by a price clerk or office man with no practical knowledge. The head of a large plumbing and heating contracting business cannot look after the little details of purchase and supply. He usually has no intention of skimping the work in any important particular, but in these days of close competitive bidding he must take advantage of every little item so as to



(a) Weak fitting; wall not the same thickness all around
 (b) Properly directed flow in a long turn T-Y
 (c) Poorly directed flow in short T-Y branch

permit him to make a lower offer than his brothers.

Cost and the Specification. Specifications are also frequently so worded as to allow substitution of good but cheaper materials, and it is considered quite legitimate to take advantage of such opportunities; but there are, unfortunately, plumbing concerns with a reputation for being tricky, a reputation earned by perhaps years of substitution and deceit. Of these there is need to warn, for if they are given a contract at a price below estimate and cost, there is little chance of inspection being close enough to force work from them which will stand through the years, unless an inspector is set over every workman and all materials are tested on delivery.

The plumbing code of your city prescribes a MINIMUM quality of materials and workmanship, and the rules cover the OUTLINE of a proper plumbing system. It is the city inspector's duty to see that you have this minimum with certain trade allowances, and that your system conforms reasonably closely to the outlines planned and, finally, that the system is water- and gas-tight at the time of inspection. A reasonably good system of plumbing should be better than the minimum in both quality of materials and workmanship, and in the little details which go to make the system satisfactory and workable. It is the duty of the architect to take care of this through complete and clear specifications, and it is the duty of his construction inspector to see that they are carried out. Many plumbing specifications are long and involved, contain many "saving clauses," and generally go much into detail about those things covered by regulations, trade conditions or practice, and are singularly vague on the details which really go to make for ultimate satisfaction in the operation and freedom from repair needs of the finished work. This leads to necessity and pay for extra work and is where the vigilance and attention to detail on the part of the construction inspector will be of value,—and a word of advice to him will not be amiss.

A System for the Architect's Superintendent. On a large project, system from the start will save much in the end. Where there is a record of every transaction, every instruction given, every interpretation of specification, and a written memorandum of every occurrence having a bearing on the orderly prosecution of the work, there can be no argument as to a dimly remembered oral statement. The keeping of

such a record is a comparatively simple matter, if it is adhered to. One large engineering firm furnishes its inspectors with small duplicating books very much like the order pad used in the corner grocery. Every time a question is put up to the inspector, he replies in writing, giving the original to the workman and noting the man's name and the time on the duplicate in his book. The slips are numbered consecutively, so as to check against loss; spoiled slips are marked; the book is filed in the office, and each night a brief reference is made to it on the record and report sheet, and it is indexed against the specification clause number bearing on the matter. At any time in the future, on a question as to the meaning of any specification provision, all notes bearing on it can be immediately located in the original duplicates, made at the time and not simply copied down later, in some report from memory. These order pads, with any lettering, printed in black ink for originals and in red for duplicates, on rough common paper set in the book in alternate leaves and with carbon paper attached, can be purchased in quantity very cheaply from those who make a specialty of supplying them.

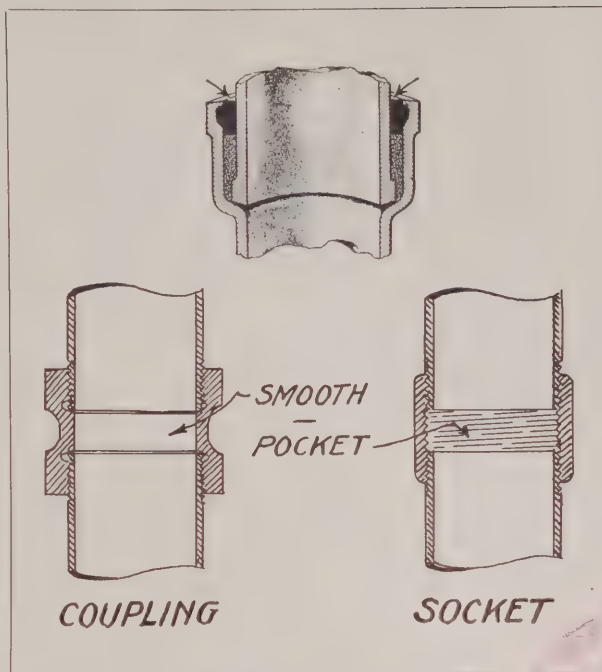
Inspecting the Sewer Work. The construction inspector will have little cause to check the plumber during the preliminary work, and he may safely leave inspection of the run of sewer and its grades and testing to the city inspector. He should, however, make a cursory examination of the character of cast iron pipe and fittings delivered on the work, noting that the weight generally and the wall thickness of the fittings are the same as those of the pipe, as fittings are more often skimmed than pipe, and weakness in a branch may develop after completion of the work and cause much damage. Pipe of unequal thickness of wall, the inner and outer circles not being concentric, should be thrown out. This defect is more common than is generally supposed and is due to improper placing of the core, or to falling of the core in the mould just before casting. It can be readily detected at the spigot end. In large buildings, foundations have probably been carried down so sewer work cannot affect them, but where foundations rest on the ground at sewer level or above, care should be taken to keep sewer lines reasonably far away, and in the case of piers, equi-distant, if possible. Foundations are sometimes affected by the looser earth of a pipe ditch becoming an intermittent water course which keeps the surrounding area wet or alternately wet and dry and throws it out of balance with dry areas of supporting ground.

It should not be necessary to caution about the danger from vibration where pipes are passed through main walls and built in solid, but such construction is rather frequent. The plumber builds in his sleeve, and after the pipe has been passed through it, the builder fills in between the sleeve and the pipe with cement mortar. This fill should always be made with a bituminous compound of some sort, and the finish can easily be made by sliding metal collars.

In case a sewer ditch is dug deeper than the final grade of sewer, it is well to require that it be supported at proper intervals by concrete yokes, piers, or other workmanlike means to spread the weight on solid ground and not on a loose refill. This requirement is usual in city codes and is sometimes in specifications; but it is rarely carried out, though it is important that it should be.

Preventing Stoppage. The inspector can insure the sewer against future stoppages, if he will see that all openings in the sewer are kept closed except when actually being worked on. Regular test plugs, caps, or turned wooden plugs should be used for this purpose. Temporary closing with rags, wads of paper, excelsior, brickbats, and similar makeshifts is almost as bad as leaving an open end, as they frequently wash or fall into the pipe and catch at some point to gradually build up an obstruction that may not be evident until after completion of the building, and then cause an expense of thousands of dollars. The same care should be extended to all pipe openings throughout the building, and eternal vigilance is the price of a clean sewer line and stack installation. If stacks are not carried up ahead of masonry, bricklayers' chips, mortar splashings, drippings from floor pourings, sticks and blocks from forms and similar debris find lodgement in the open pipe, fall down the vertical, and catch in the offsets and the horizontal lines. Terrazzo polishers and floor finishers generally are the greatest offenders and are hard to cure of the habit of pouring the cement washings down the nearest stack line. Millions of dollars are wasted annually in old and new buildings in cutting out traps, pipe and fittings found partly filled with dried and set cement washings.

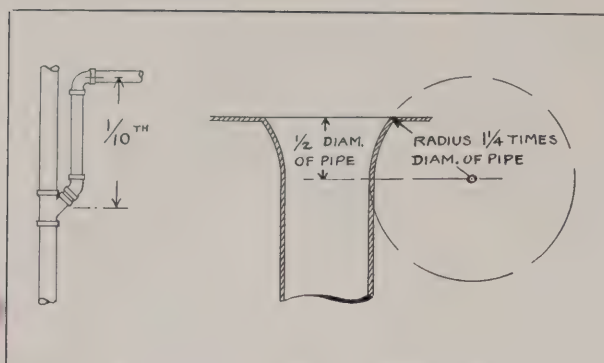
Stacks and Branches. When the stacks and branches are run there are a great many opportunities for poor workmanship and some for substitution of materials, and the inspector should be especially vigilant. It is to be presumed that the specifications cover the important question as to whether the soil, waste and vent piping is to be extra heavy cast iron, galvanized steel, or genuine wrought iron galvanized. It is not the purpose of this article to draw distinctions between the advantages or disadvantages of using the three materials, but in deciding the question as to the best material to use, the architect and his construction inspector should consider the material of which the structure is to be built and select the pipe which will give the best service for the "reasonably-to-be-expected life of the building." This does not necessarily mean total life, but the number of years before a complete remodeling is necessary to bring it up to date. In the business section of a rapidly growing city, once magnificent structures are frequently pulled down in 15 or 20 years to make way for larger and more magnificent buildings, and some authorities have even estimated that the average life of a "skyscraper" is limited to 30 years. Not that the structure becomes dangerous, but that the time arrives when the cost of upkeep



(Above) Grooved hub to prevent "creeping" of lead joints
(Below) Smooth surface of coupling contrasting with vulnerable "pocket" of ordinary socket joint

overtakes its earning power, principally through extensive repairs to heating and plumbing equipment, elevators, and mechanical equipment generally. By making our piping system of pure lead or pure copper, providing for expansion, self-welding all joints, and completely insulating it from contact with building material through wrapping with an enduring damp- and decay-proof cover, we might be able to plumb our buildings to endure for hundreds of years; but, except in the case of a very few monumental buildings, this is unthinkable on account of the cost and the pipe space necessary. Brass pipe in the larger sizes and the fittings for it being beyond the usual purse, the choice is restricted to the first mentioned three kinds of pipe, and sufficient information can be obtained through trade sources to select intelligently that which will best answer the needs on the particular project.

Pipes and Joints. One argument against the use of cast iron pipe in tall buildings is the "creeping" of lead joints, so often heard of but rarely seen. If trouble of this kind is anticipated and cast iron is otherwise indicated but is frowned on for this alone, it is easy to specify the type of pipe with annular grooves cast inside the hub, which pipe can be furnished by any foundry. The lead cannot work out of this sort of a joint. There are substitute materials on the market to save the cost of handwork in calking, but they have not generally proved satisfactory. Either hot poured lead or pure lead wool, well calked, makes a satisfactory and permanent joint. Some architects object to the greater space occupied by the hubs of the cast pipe, projecting every 5 feet some $2\frac{1}{2}$ inches more than the smooth wall of rolled pipe which can be cut in story-height



(Left) Method of connecting branch rain leader to avoid splashing and poor flow

(Right) Method of forming rain leader entrance at roof

lengths, allowing fittings to come in floor construction. It may be superfluous to note that all fittings on soil, waste or rainwater lines of galvanized steel or galvanized wrought iron should be of the recessed drainage pattern, though it is not necessary that they be themselves galvanized unless called for by the code or the specifications. The zinc coating is a very necessary protection to the rolled pipe, which by reason of its laminated structure is more subject to corrosion than the granular texture of the cast iron of which the fittings are made. Galvanizing simply adds about 60 per cent to the cost of the fittings without any corresponding benefit, and is apparently a survival of the day when it was the practice to have the fittings of the same finish as the pipe, without study as to the necessity of it. If not prohibited by code or otherwise, uncoated fittings, such as the heavy steam pattern, are suitable for use on vent lines, but heat-treated or malleable fittings must be galvanized, as the process changes the texture so as to require protection. Malleable fittings are always used on iron water or gas piping; therefore, fittings on such work will always be galvanized.

One refinement which can be, but rarely is, practiced, is to require that all exposed threads on the pipe be painted with red lead or asphaltum to protect them. Naturally, when pipe is threaded the zinc is cut off, leaving the steel or iron exposed to corrosion at the worst possible place, immediately at a joint where strain may develop. Some day the practice will be to have all fittings countersunk or recessed so as to protect threads, and until that time comes, protection of exposed threads is desirable. Nipples should match the pipe. If galvanized steel pipe is used, galvanized steel nipples will be in order, but if wrought iron pipe is specified, the construction inspector should see that the nipples are of the same material and preferably of the same make. All wrought iron nipples are plainly marked with knurling or letters, while steel nipples are not marked. See that the short nipples as well as the long are galvanized. There is quite a difference in cost between black and galvanized, and between steel and iron, and substitution is easy.

All rolled pipe for plumbers' use, whether steel or iron, is delivered with both ends of the length

threaded, and with one thread protected by a band coupling commonly termed a "socket." This was originally furnished by the maker to protect the thread on the end commonly dragged in handling, and is a steel or iron band spun or rolled from the same material as the pipe and threaded clear through. The practice grew, and is prevalent in all but a few cities where the code forbids, of using the thread-protecting band sockets as couplings to connect the pipes on long runs. There are several reasons why this practice is bad. Dirt from handling frequently gets in the threads, they are often jammed in handling, and are threaded with a running or continuous thread instead of a taper thread such as all proper fittings have. A running thread does not make as tight a joint, is more likely to loosen under strain, and from the theory standpoint cannot make up into a permanent, gas-tight joint. In practice such a joint usually rusts tight unless there is much strain or vibration, and then it causes trouble by persistently breaking out in leaks. It leaves a slight pocket in the line to catch paper and solid matter and build up an obstruction, and finally, from a structural standpoint, it is undesirable because it is not only of the same laminated structured material as the pipe itself, but by reason of the method of making it, the grain is crossed. In any event, it cannot make up into as straight, true and tight a joint as a taper thread, cast recessed fitting, like the others in the line.

Fittings. Many city codes forbid the use of short turn fittings altogether; others permit them where the change in direction is from horizontal to vertical; but many of the city codes still permit their promiscuous use, though they are becoming stricter on this point each year. An abrupt change in direction from a horizontal line of pipe to a vertical drop might not be detrimental to the continued satisfactory functioning of the system, but if the specification or the code permits, the inspector should require that all branch lines discharging into a vertical main do so through a long-turn fitting partaking more or less of the nature of a combination of a "Y" and eighth-bend, and condemn the so-called "sanitary" tee, a short-turn pattern. If the vertical main is a vent above the fitting, the fixture discharge splashes against the back wall of the fitting, sprays up into the unwashed part, and tends to gradually build up a mound of greasy material or other solid matter until the vent is closed off and ceases to function. If the main is a soil or waste, the excess head of the discharge from above or the selectivity of a solid stream tends to bar entrance from the branch, the fixture discharge is sluggish, and the branch pipe is not sufficiently self-cleansing.

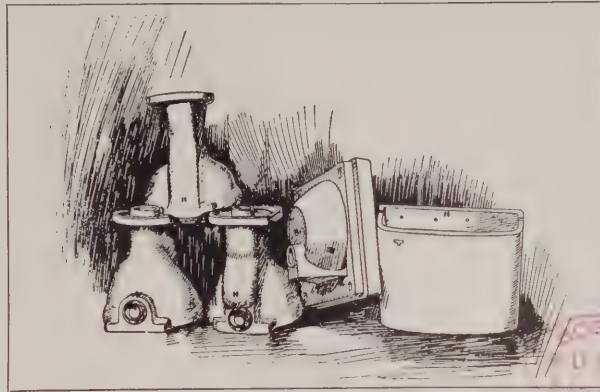
The use of the terms "long turn" and "short turn" simply refers to manufacturers' classification, and the radius usually follows no set standard. In fact, many cities prohibit a short-turn soil pipe fitting with a longer radius than a so-called long-turn screw pipe fitting, simply because of the maker's classification. In the case of the branch fittings, some codes

require that the top of the arch of inlet shall break through the wall of the running line at a point at or below the center line of the inlet. This appears to be ample for the purpose and does not require so much projection of the inlet branch as would be the case of a combined "Y" and eighth bend, but such a fitting should never be used to discharge a vertical waste into a horizontal running line.

Sleeves should be used where pipes pass through floors, as pipes should not, in any case, be cast in solidly when a concrete floor is poured; neither should stacks ever be built in solidly in chases or wall construction. Adequate support of the pipes themselves should be provided by yokes, suitably fastened to the pipes and resting on floors or other construction. Too often the weight of the stack is carried by the branch fittings, thus putting great strain on them. Pipes in a plumbing system are peculiarly subject to troubles caused by expansion and contraction and should never be built or cast in solid in concrete or other masonry. This is especially true of fittings. Not only does the index of expansion differ materially between the masonry and the pipes, but the pipes carry alternate volumes of warm sewer air, cold water, and even hot vapors.

In installing cast iron soil and waste stacks, joints should be straight to avoid leaving shoulders in the hubs, but with wrought pipe it is immaterial whether pipes are plumb, canted or offset. An exhaustive investigation by the Bureau of Standards indicates that regardless of height or of any slight variation from the vertical, the falling water-borne waste increases its velocity of fall at a normal rate of acceleration until the friction on the sides of the pipe becomes greater with the increase of velocity than the force produced by acceleration, and thereafter the rate of fall remains constant. In the experiments and deductions it is indicated that the rate of fall of fixture discharges in a stack of any height, even including that of the proposed 110-story building in New York, will not exceed some 28 to 32 feet per second, depending on conditions. This would not apply to rain leaders which might conceivably be running solid or under head. It does, however, give rise to speculation as to whether much smaller soil stacks could not be used in very large buildings, with much saving in space and cost of material. If the velocity in a 4-inch horizontal branch graded $\frac{1}{4}$ -inch per foot is 3 feet per second, and the rate of fall in a stack is ten times that, then the stack could dispose of the discharge of ten branches loaded to capacity provided they discharge into the stack at different points, if capacity is arranged at the foot to get the total discharge away without interference with the flow from the stack; and the writer expects to see this practice exemplified in some larger buildings.

Rain Leaders. In the matter of interior rain leaders, the construction inspector is solely responsible for getting a good installation by the plumbing contractor. Outside of the matter of sizes, and a requirement that the roof connections be tight, the



Showing marking on vitreous china fixture "culls" or seconds; two short parallel red lines where shown

city code leaves it open, and rain leaders are seldom detailed in the plans, and only roughly covered by the specifications. It is up to the man on the work to look after some mighty important details of installation. One problem is that of getting an amount of roof water equivalent to the capacity of the downpipe into it. Slope and area of roof must be properly proportioned, but there is the loss of effective area due to entry through a right-angled orifice. This loss of effective area is about one-sixth for any constant velocity in the smaller sized pipes, but it can be eliminated and the full area of the downpipe utilized by spreading the top of the pipe out into a small, cone-shaped opening with curving sides. The height of the cone should be half the diameter of the pipe, and the radius of the curving sides one and a quarter times the diameter. A table covering the different sizes can be worked out and templates made, it being borne in mind that the sides of the inlet must be curved at the proper radius.

If the code permits and the building is taller than its surroundings, with no roof garden or condition under which sewer air would be a nuisance, traps should be left off main rain leaders, only including them on leaders from courts, balconies and other surfaces lower than the main roof, and on main leaders which have branches from them. If they are necessary, it is better to group them, several on a trap. In those cities having combined sewer systems taking both rain water and sanitary drainage into the same mains, it is better construction to separate the two systems inside the building and join them in the house sewer outside the walls, increasing the size from that point. In such a case a single trap can be made to serve for all. Where branch rain leaders from courts, oriel, balconies or bays are connected into vertical leaders from the main roof, two conditions must be provided against,—the possibility of impounded air in the main line blowing out through the shorter branch and causing spouting, and the practical closing of the branch owing to solid streams of water in the main downpipe. Both of these conditions can be avoided by turning the branch down parallel to the main leader for some several feet, and then branching through a "Y" and

eighth bend. The vertical pipe run of the branch should be not less than one-tenth of the length of main pipe above the junction. Such a connection will tend to accelerate discharge from a branch line instead of to retard it, and will not require increasing size of leader unless the branch takes a large area.

Inspecting Roughing-in. In roughing-in or getting piping ready for fixture settings, too much stress cannot be placed on checking all measurements to some permanent point and level. The inspector should personally see that the journeyman has followed the manufacturer's directions as to measurements, and that all outlets are square or plumb as the case may be, and are left flush with the finished floor or wall line. The journeyman may say "I'll straighten that when the fixtures are set." The time to get the measurements right is at the time the pipe is installed, and insistence on this point will save regret later. In case of a large general toilet room, with the fixtures in battery, a template should be made of lumber for each battery, with the outlet centers plainly marked. Fixtures cannot be set square and gas-tight if the connections are not in the proper places, and the appearance and stability of the finished work depend on the faithfulness with which this portion of the work is handled and supervised.

Shower Pans and Other Connections. In case lead pans are used under the floor finish for shower compartments, the lead should be liberally coated with asphaltum on both sides before setting it in place; and after connecting the waste, it should be temporarily plugged and the pan kept full of water till the cement and tile are ready to put down. Dry pans are apt to develop leaks which do not show up till after completion and the shower is put in use, and the water contents have a tendency to prevent workmen from walking in them, using them for tool receptacles, and similar abuses. Many architects prefer a four- or five-ply tar paper and hot pitch shower pan to lead, but the continuous water test should be used just the same. If lead closet bends or stubs, or other lead connections are specified, they should be painted with asphaltum after test and wrapped with tar paper or sheet asbestos.

Quality of Fixtures. It is not often that plumbing contractors try to slip in "culls" or second grade vitreous plumbing fixtures, but if they do, it can easily be detected through the presence of two short parallel red lines at the top rears of closet bowls (sometimes under flushing spuds), on the sides of the basin bowls of lavatories, and on the inside backs of closet tanks just under the covers. Perfect ware is, of course, not practicable commercially, and certain minor defects are allowed in each piece. Classification of enameled iron ware is shown by pasted labels. It is suggested that Department of Commerce Bulletin No. 52, on "Staple Vitreous China Plumbing Fixtures" will be of interest to all construction inspectors. Substitutions which frequently occur when the fittings are not purchased with the earthenware fixtures, are composition lavatory, bath, and closet

tank supplies, and nickel plated iron supplies and trap waste nipples to wall. These are easily detected.

Valves. The matter of valves rarely receives attention due a subject of such interest to the one who is to keep up repairs on the work. Every fixture in the building should be valved so that repair at any one fixture will not necessitate cutting a whole line out of service, and every riser or return line should be valved at the foot where it leaves or joins the main. Cross-connections between lines for emergency use should be as few as possible, and they should be grouped and valved so that operation and changes are all controlled at one point. If it is necessary that a valve in the combination be located at a distance, it should be motor-operated (no matter how small it is), and the operation and tell-tale located with the other valves. In a building of any size, all valves should be numbered, the piping and valves diagramed, and a copy furnished on completion. Valves buried in walls or floors should either be in suitable covered boxes or the bonnets should be so left that repairs can be made from the surface. Globe valves seriously interfere with flow of water, having something like 20 times the frictional coefficient of a gate valve of the same size, and if used at all on horizontal lines should be inserted in the line with the stem in a horizontal position so that the lines can be drained. The cost of repairing a small valve is equal to more than its first cost, so it is of paramount importance that the valves be selected with great care. It is also desirable in general to have all valves of a class of the same make.

Water Pipes. Water pipe sizes are usually fully covered in the specifications for the work; if not, it is the duty of the construction inspector to check the plumber's layout and see that the sizes are ample, especially the supplies to flush valves which require a rate of flow equal to about five times as many closet tanks. These larger sizes for flush valve operation generally apply only to sizes below 3-inch, as the principle of overlapping operation tends by reason of the short flush of the valve to overtake the size required for the longer tank fill. Every installation should have the sizes accurately figured, taking length of pipe, number of elbows, number and kinds of valves, and initial head or pressure into consideration. Nearly all makers of flush valves are glad to furnish formulæ and tables which facilitate the laying out of a suitable piping system. Care should be taken to keep velocities below a point that may cause singing in the pipes, and in large or high buildings, the judicious use of water-pressure regulators is recommended to keep pressures within reasonable limits. Water hammer can be guarded against by the use of shock absorbers, there being several on the market, at least one of which needs no relief pipe, repair or readjustment, and can be plastered over in the wall or floor construction after it has been once set. These shock absorbers take the place of the obsolete air-chamber, which soon after installation becomes waterlogged and of no effect, and fails to operate.

A WELL PLANNED ARCHITECTURAL OFFICE

THE OFFICE OF
B. H. WHINSTON

AN architect very rarely has the opportunity of finding an office space exactly suited to his needs. From his student days onward he always has his ideal office in mind; the scribbles on the edge of his first *projet* may be expressions of his dream of the office he will some day control, where clients will flock to see him and where he will diffuse the atmosphere of his own personality. When he at last has his diploma and begins to work over the drafting board in some established architect's office, his ideas concerning his own office are usually materially changed. He realizes that he must provide some space for contractors to look over blue prints and to take off quantities. He must also provide for waiting clients and salesmen.

In one of the smaller cities he may be able to build an attractive little office structure of his own, demonstrating his ability as a designer. In the larger cities he is usually forced to seek office space on some upper floor, and to adapt this space as well as he may to his purposes. In New York it may seem particularly difficult to obtain just the right light and space conditions. Mr. Whinston, whose office is here illustrated, searched high and low, and finally located a bare penthouse loft in a six-story office building. The loft was 28 feet square and 14 feet

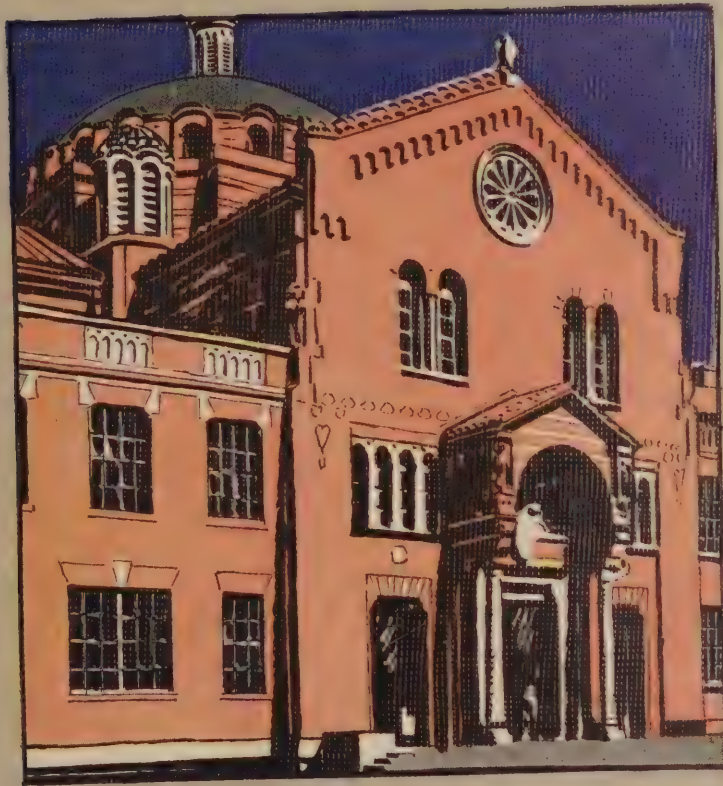
in height, with light on three sides. Usually, an office of this size has a meager supply of light from only one side. The penthouse had a large studio window on the north, which gave an ideal light for the workers in the drafting room. A window was installed in the south side, so that daylight is now admitted on all four sides.

One enters the office by ascending a small stair which opens directly into the reception room. The combined stenographer and switchboard operator controls this room and the entrances to the private office and the estimating room. The estimating room is strategically placed, so as to be directly available from the reception room for contractors, and from the drafting room, so that plans and information are easily available. A second door leading from the reception room admits one to the private office which, in turn, connects directly with the drafting room and with the library and sample room. The private office is finished in walnut pilasters and paneling. The panels above the doors and windows are appropriately decorated with plaques representing the various arts, such as sculpture, painting, architecture, music and poetry. The large panels give excellent settings to renderings of drawings and photographs of the architect's work. The ceiling is attractively coffered.



View of the Architect's Private Office

THE
ARCHITECTURAL
FORUM
IN TWO PARTS



PART ONE
ARCHITECTURAL DESIGN
MARCH
1928

SCHOOL BUILDINGS REFERENCE NUMBER

PRICE \$3

Announcing

THE COMMON BRICK SCHOOL BUILDING COMPETITION

for PHOTOGRAPHS *and* PLANS *of* SCHOOL BUILDINGS
Having Exteriors Constructed of Common Brick*

Competition Closes November 6, 1928

PRIZES

This Competition and its Prize Awards are divided into two classes, as follows:

**GRAND PRIZE \$500

for the best building in either class

CLASS A	CLASS B
FIRST PRIZE .....\$500	FIRST PRIZE .....\$500
SECOND PRIZE 250	SECOND PRIZE 250
THIRD PRIZE 100	THIRD PRIZE 100
FOUR HONORABLE MENTIONS 50 EACH	FOUR HONORABLE MENTIONS 50 EACH

*DEFINITION: A common brick, as defined by the Common Brick Manufacturers' Association of America, and for the purposes of this competition, is a solid building unit of burned clay having a natural surface not treated to produce special effects in color or texture of the individual brick but including "clinker," overburned, and "cull" brick. Types of common brick construction and finish admitted in this competition are explained in the following conditions and in the accompanying booklet.

**This grand prize will be awarded by the jury after selecting the first prize winner in each class. It will be awarded in addition to the first prize, making a total prize of \$1,000 for the best entry in the entire competition.

THE first and second Common Brick House Competitions, held during 1926 and 1927 developed such widespread interest that architects in all parts of the country submitted photographs and plans of many of the finest common brick dwellings that have been erected in recent years. The response from the architectural profession has definitely proved the popularity and value of these competitions.

These two competitions have for the time being quite thoroughly covered the field of house design. It has been decided to conduct a competition in 1928 which will cover the very interesting field of school building design.

All types of school buildings in which the majority of rooms are used for class-room purposes may be entered in this competition, provided 75 per cent of the exterior walls is surfaced with common brick. Small or large school buildings have an equal chance to win the award in this competition for the prizes have been divided into two classes, as given below, Class "A" calling for buildings of limited volume, and Class "B" permitting the entry of the larger buildings which necessarily offer the architects a broader opportunity for fine treatments of mass and detail than is generally accorded the designer of small structures. A grand prize is offered, which will be awarded to the first prize winner in either class whose entry is judged the finest submitted in the entire competition.

The division of school buildings and prizes into two classes is made on the following basis:

Class A—School buildings having an actual cubic foot volume not exceeding 700,000 cubic feet.

Class B—School buildings having a cubic foot volume in excess of 700,000 cubic feet.

It should be noted that the buildings shall be those used predominantly for class-room purposes, which excludes structures used solely as dormitories, libraries, gymnasias, and other accessory buildings. It would include, however, buildings which may contain these facilities as accessories to space devoted primarily to instruction purposes. The competition is open to public, parochial, and private school buildings and buildings for preparatory schools, colleges and universities, falling within the limitations above defined.

This third Common Brick Competition, like the preceding competitions, is quite simple in its nature, because instead of sketch plans requiring extensive drafting-room work and new creative designing, it calls for photographs and floor plans of school buildings already constructed or which may be completed in time to submit the required entries before the closing date, NOVEMBER 6, 1928. From the point of view of the architect, it should prove to be an interesting type of competition because it requires comparatively little time, the project resolving itself into the simple procedure of obtaining good photographs and submitting them with floor plans and the cubic footage.

*Send for Complete Announcement and Program Containing All
Conditions of the Competition*

This competition closes NOVEMBER 6, 1928 and is conducted by

THE COMMON BRICK MANUFACTURERS' ASSOCIATION of AMERICA
Guarantee Title Building, Cleveland, Ohio

THE STAINED GLASS OF CENTRAL EUROPE

GENERAL SHERRILL is an indefatigable glass pilgrim, an intrepid student of stained glass, who haunts the cathedrals of Europe for the sheer joy he finds in studying the parti-colored light that streams through their stained glass windows and in reading the stories written thereon in the universal language of picture. Already he has traversed England, France, Italy and Spain on intensive stained glass tours, each journey recorded in a volume on that land; and now he has completed his quintet of volumes with his "Stained Glass Tours in Germany, Austria and the Rhine Lands."

So thoroughly has he traversed these countries that one pictures him traveling on foot, or, most luxuriously, on bicycle! Surely the railroad and the motor car could not find their sophisticated way to the obscure villages and hamlets whose cathedrals he has included in his route! In fact, it is this very thoroughness which saves his volumes from monotony. The less careful tourist who reads them is continually amazed at the beauty spots he himself must have overlooked, and he might well peruse these "Stained Glass Tours" with pencil in hand to jot down places for future investigation, or to note elements of beauty he failed to discover in those cathedrals he fancied he knew. For instance, in Notre Dame, did he stop to realize that the indescribable purple light which pours in from the north rose window is due to the fine juxtaposition of tiny pieces of red and blue glass?—or was he aware of the constant changes of light with the advance of the sun in its cycle that make the same interior quite different in the afternoon from what it was in the morning? The play of light through color forms a charming study, and the stained glass pilgrim enjoys it as keenly in the interior of a cathedral or castle as when he is among the blossoming trees of the highway.

General Sherrill makes all this clear in his book, for he is a connoisseur of glass. He knows the era to which each piece belongs,—whether to early or late Gothic, to Romanesque or to Renaissance,—and he can identify its nationality; for to him glass *has* nationality. The glass of England, France and Germany all have racial traits on their faces, and color and design that stamp it as the product of a definite country. Along the Rhine and in Austria, he says, "it speaks German with a guttural accent in the deep reds, greens and russet browns that shine through cathedral windows, and in the sturdiness of their design. It is more heavily leaded than in the other countries, and geometrical figures replace the jeweled medallions of the French. The English are preëminent in their skillful use of early *grisaille* (glass without figures or pictures); the French, for their early mosaic medallions and their glorious Renaissance pictures"; but glass workers of no other country, he explains, "can surpass the depth and warmth of tone that shines in the windows of Germany's cathedrals, churches, abbeys and castles." Indeed, it is in Germany, General Sherrill believes, that the glass pilgrim is most richly rewarded. This is because the art of glass reached a higher development there than it did in either France or England. This is due to the fact that this fine art ran

uninterrupted by war through five continuous centuries,—the eleventh to the fifteenth. In England and France it was halting; art suffered interruptions by war; in Germany the course ran smoothly, and to a glorious result.

This book records visitations paid to the cathedrals, churches and castles of 97 cities and villages, some of them so tiny and obscure, so off the beaten tourist path, that they are not mentioned in any Baedeker. In fact, this volume is, in one sense, a glorified Baedeker of German and Austrian windows, including those of Alsace, which, he explains were made under German rather than under French influence. Yet to tabulate it as a "Baedeker" is to do the work an injustice. The author calls himself a "glass pilgrim," and this he truly is, but he is also a scholar, diplomat, soldier and artist with it all, which forms a rich background of experience from which to tell his story. Interspersed are bits of travel and personal happenings which make the work of interest to the novice as well as to the advanced student of glass. His tour was made in three different periods, all within ten years. Begun in 1914, it was interrupted by the war,—resumed in late 1918 with the war over, but Germany still hostile, and finished in 1925 when Germany was once more welcoming American tourists. He claims to be the only student of glass who inspected windows under police surveillance! Detained in Münster by military authorities from August 4 to 12, 1914, he obtained permission from a Prussian major to examine the old glass of the Cathedral of Hanover under the eye of a German military policeman, with whom he was forced to report every day to military headquarters! This proves the degree of enthusiasm in which his glass pilgrimages were made. Later, as adjutant general of the American forces overseas, he made his own tours in the Rhine Lands, always concentrating on the glass rather than on the fine architecture of the buildings he visited. The volume is illustrated with 18 photographic reproductions.

STAINED GLASS TOURS IN GERMANY, AUSTRIA AND THE RHINE LANDS. By Charles Hitchcock Sherrill. 304 pp., 5½ x 8½ ins. Price \$4. Dodd, Mead & Co.

NEW TRAILS IN OLD SPAIN. By Vernon Howe Bailey. 313 pp., 5 x 7½ ins. Price \$3.50. J. H. Sears & Co., Inc., New York.

ARCHITECTS, and particularly architects interested primarily in design, may easily learn much from the "travel" books which, particularly since the ending of the World War, have been appearing in large numbers. In these volumes travelers record their experiences and their impressions of the places visited, and sometimes they bring to popular attention corners of the world not often explored. These volumes are more than ever interesting when the traveler is also an artist, and when he records in his sketchbook his impressions of the old towns to which he journeys, sketches which suggest as the printed page can never do, the actuality of what exists. This is what Mr. Bailey has done. His pages of text are illustrated by the spirited sketches, of the kind for which he is well known, and both text and sketches have a high value, and particularly for architects.

GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency even a few years ago.



Kensington Schoolhouse, Great Neck, N. Y.
Wesley Sherwood Bessell, *Architect*

THIS volume, a companion to another published in 1914, records the results of endless study and experiment in different parts of the country, summed up and presented. By illustrations of exteriors and interiors, by floor plans and carefully written descriptions and articles by well known architects and educators the present high standard of schoolhouse design is made plain, and these results which have been achieved by a few architects and school boards are thus made possible to all architects who are interested in schoolhouse design. The compiler has selected from almost 1000 exteriors and floor plans the school buildings to be illustrated, and the volume records "a process of innovation and elimination, namely, the introduction from time to time of features which have been deemed desirable and practical, and the elimination of things which, owing to changed school methods, are no longer required."

400 pages; 7 $\frac{3}{4}$ x 10 $\frac{1}{2}$ inches
Profusely Illustrated; Price \$10

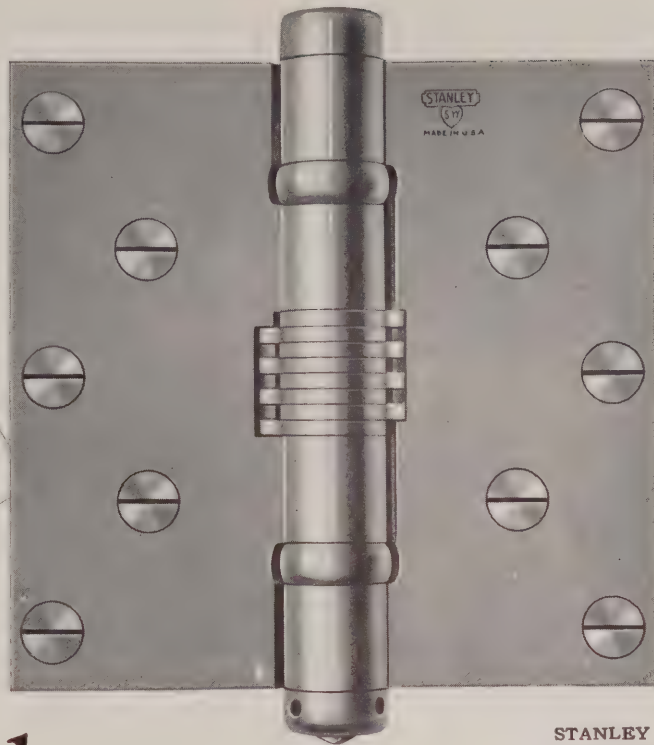
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THE WALNUT COLLECTOR. By Mac Iver Percival. 294 pp., 5 $\frac{1}{8}$ x 7 $\frac{3}{4}$ ins. Price \$3. Dodd, Mead & Company, New York.

IT is the intention of the writer of "The Walnut Collector" to give the reader a comprehensive knowledge of the characteristics of walnut furniture made in England between 1660 and 1730, so that the collector may be armed with definite information when he buys from a dealer or explores out of the way haunts. This the author does in elaborate detail, first giving a general picture of the times,—how oak furniture was used by the more primitive people, while the new mode of living for the educated classes required walnut. Later chapters take up each piece of furniture in its development, and point out its distinguishing features. Up to the beginning of the walnut period, the usual method of joining the parts of furniture was with mortise and tenon. During the latter half of the seventeenth century, this method was almost entirely abandoned for court furniture, and the "dove-tail" joint came into use. Glue was used to attach veneer, and strength was obtained by a close fitting of balanced parts rather than by massiveness, as it formerly was. In about 30 years more advance was made in the shaping of legs and stretchers than in the previous two centuries. Stretchers were in use until about 1700. The French leg or inverted cup turning came into vogue about 1690. With the exception of introducing use of springs and seats, there has been no great improvement in the comfort or convenience of furniture during the last 230 years.

Walnut is an ideal wood for chair making. Many interesting chairs were designed, the Charles II with the caned backs, the William and Mary, and the small Queen Anne chair with the cabriole leg. Tapestry coverings were popular during all that time. Black chairs, chairs of painted woods, and those of ebony veneer are interesting examples that can often be picked up easily, due to their being unfamiliar to the smaller dealers. All day-beds are rare. The usual type of the seventeenth century day-bed is a long, narrow couch, with a caned seat, having a supported back at one end. This is frequently arranged as a movable panel, adjustable to the convenience of the user. The ornament and construction are quite similar to those of chairs and stools of the time, and without doubt day-beds were designed to be used "en suite" with chairs and stools to match. The "drop-in" seat settee was introduced late in Queen Anne's reign; both back and legs on the best of these are beautiful examples of the chair-maker's art. The frames, while following the general lines of two armchairs side by side, sometimes have only four legs; six however, are more common, and there are a few three-back settees having eight legs. Stools were used by women who by reason of their rank were entitled to sit in the presence of royalty. During the walnut period, they were mainly in the nature of survivals, being made in most instances for great houses or royal palaces, and they were generally of fine workmanship. Genuine old stools are rare and in great demand, and the prices are higher than for chairs. It is no wonder that so many stools are copied by those specializing in antique models. The buyer should exercise caution.

The canopy bed was popular among the richer classes and was hung with magnificently embroidered silk, linen or chintz. Chintz, while not as expensive as silk, was very popular and was considered suitable for the "best



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beds," not counting the "state beds." Queen Mary held this fabric in high esteem. There were also beds with no canopies but with ornamental head pieces. Among tables, one finds many of marquetry,—card tables, a few of the "gate leg" type, and candle stands. Before 1725 dining room tables were of oak. There were comparatively few independent cupboards. Book cases and china cabinets were rare; china was generally kept in recesses in walls. Mirrors were very fashionable, but scarce and expensive. Toilet mirrors frequently came "en suite" with the toilet articles, or matched tables and *gueridons*. Marquetry-framed mirrors came in the reign of Charles II, and were important features in the decoration of a room. Glass-framed mirrors were much admired. Some of the mirrors may have been of English workmanship, but the greater number were imported from Venice. The seventeenth century saw an enormous increase in use of time pieces. The long case clocks were all very much alike, a straight-sided, tall, narrow body, mounted on a base, with a head almost invariably rectangular, with the dial flanked by a pillar on each side. Small clocks, except in size, followed the pattern of the larger. Walnut chests of drawers survive in large numbers in almost every form,—bureaus, single, double and cabinet chests, "baby" and "giant" chests. At the present day, chests can be bought more easily than other pieces of walnut.

There are several types of desks,—the cabinet with the flap; the chest with a pull-out drawer for writing; the sloping top bureau, sometimes with secret drawers in the recesses; and the "knee hole" writing desk. The general arrangement and proportions of these cabinet bureaus differed very little throughout the period. A chapter devoted to brasses gives examples of the pear-drop handle, of ornate escutcheons, and practical advice on original and reproduction hardware. In concluding, the author discusses the preservation and care of walnut furniture, giving a formula for furniture polish along with much useful information and advice on the problems that confront the average collector. He also tells of his own interesting experiences in hunting for furniture. There are short paragraphs on the more important furniture designers and clock makers, and an excellent and useful glossary explains the terms used in the book.

INTERIOR ARCHITECTURE; THE DESIGN OF INTERIORS OF MODERN AMERICAN HOUSES. By R. W. Sexton, with Foreword by Charles A. Platt. 114 pp., 9¼ x 12½ ins. Price \$7.50 Net. Architectural Book Publishing Co., Inc., New York.

CURRENT publications which deal with architecture, decoration, furnishing and like subjects supply a rich and varied record of the standards which just now obtain in those spheres of effort, and the importance of their illustrations gives them a value sufficiently great to cause regret that their preservation in some other form is not more frequently attempted. It is a cause for satisfaction, therefore, when there appears a volume made up largely of illustrations which have already seen the light of print in some periodical, accompanied, now that they appear in volume form, by text dealing with the subjects which the cuts illustrate. Such is the present volume, devoted to illustrations of American interiors, entirely of residences, and presumably of those of moderate size and cost. The text which accompanies them deals with topics likely to interest architects and particularly valuable to decorators, in addition to being useful to home owners.

THE ESSENCE OF ARCHITECTURE. By William Roger Greeley. 119 pp., 6 x 9 ins. Price \$2.50. D. Van Nostrand Company, Inc., New York.

THOSE whose sphere of effort lies within the province of any field of art are often likely to miss something of the message which the art should convey,—to lose, in a sense, vision of the forest because the view is shut off by the trees close at hand. Particularly is this true when one is an architect, absorbed by matters of designing and questions of actual construction, the demands of clients and the intricacies of dealing with contractors and builders. Only when the routine of the office is out of mind and when there comes an opportunity for obtaining a proper view of the forest, do the mystery and beauty and the splendor of its verdure become evident and visible. Only then can they be enjoyed.

These interesting essays or chapters upon different phases of architecture are probably the fruit of interludes in the work of a busy architect. They prove that exercise of the critical faculty is by no means confined to the composition of facades or to the drawing of floor plans, nor to details of fenestration or designing interior woodwork, but that this faculty is perhaps even more properly and effectually exercised when it is devoted to emphasizing or underscoring certain passages in the message which architecture is quite ready to convey to those who have but the patience to give heed. Many of these passages have been emphasized again and again, but just as the Gospels have provided texts for discourses for 20 centuries and are not yet exhausted, so the teachings of architecture still provide matter for teaching when one starts out to present architecture's message in terms which are fresh and new, which the world really needs.

This is what Mr. Greeley has done. Much writing on architecture fails of fulfilling its mission, or else falls short somehow of complete success, because of vague or perhaps indefinite treatment,—much use of metaphors not readily understood and of language which is vague and indefinite, the result being the discouraging of precisely those most in need of enlightenment. Many writers might object to one's demanding the pointing out of the wholly obvious to those who have—or should have—mastered the fundamentals; but unfortunately many people who are quite willing and even anxious to learn are unfamiliar with even the elements of architectural appreciation, and it is necessary to point out the obvious to those not yet able to see—or rather to discern—for themselves. Unless this is done,—and Mr. Greeley does this and far more,—it is merely like preaching to the already regenerate—to those not in need of the message. There is probably no art more in need of easily understood interpretation. Because this has been to so great an extent lacking, the enjoyment or even the understanding of architecture is still a sealed book to many. The headings of some of the 14 chapters indicate the scope of the work and suggest the definite terms in which the subject matter is treated:—The Arts; The Fine Arts; Architecture; Elements in Architectural Composition; The Background; The Purpose; The Medium; Architectural Personality; Unity; Balance; Emphasis; Proportion, etc. The work might well be studied by anyone interested in obtaining knowledge of what architecture really is, and its teachings are well worth the attention of even the advanced student. Most fortunate has been the selection of the illustrations which explain and elucidate the text pages.



Alameda, Cal. — Lincoln School



Detroit, Mich.—Central High School



Freeport, N.Y.—Freeport High School



Norfolk, Neb.—Senior High School



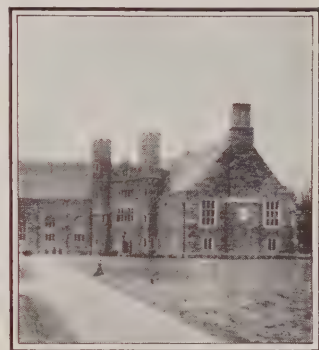
Evanston, Ill.—Evanston High School



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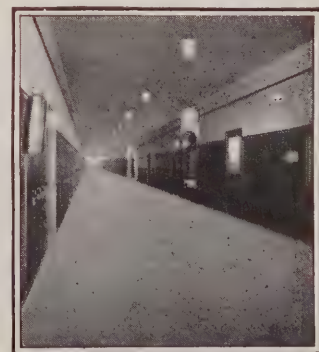
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OLD HOUSES OF NEW ENGLAND. By Knowlton Mixer. 346 pp., 5½ x 8 ins. Price \$5. The Macmillan Company, New York.

THE student of domestic architecture finds that certain of the old buildings of New England derive their characteristics from far back in English architectural tradition. True it is that many of the later buildings reflect all the changes that the fluctuations of custom and fashion brought to England during the Queen Anne period and the Georgian era, but the older houses of the colonists were closely akin to the homes they had left behind in England,—not of stone, to be sure, and not often even of brick, but wrought of the materials easily and quickly to be had in the new land, materials which beneficent Nature had placed at their convenient disposal.

There are, of course, countless works on the old buildings of New England, and yet each of the many possesses certain qualities which render it valuable. In this particular volume the quality might be said to be primarily architectural, for the author has dwelt not so much upon the historical side of these old houses nor even upon the social life for which so many formed the setting as upon their architectural charm,—the charm inherent in rigid simplicity, huge and cavernous fireplaces, brick ovens, rough-hewn beams, and “overhanging” upper stories, or the later and more refined and sophisticated charm which is given by paneling, traceried transoms, and delicate woodwork and stairways. One element of the volume’s value to the architect lies in its illustrating old homes in many parts of New England, for the old houses at Duxbury or Ipswich differed considerably from those around New Haven, New London or Providence. The

illustrating of these varied types side by side presents an opportunity of studying the different types or versions of what is broadly known as “New England Colonial,” and the study is likely to induce in the work of discriminating architects a careful adherence to type which gives to the style an added charm and a new and stronger interest. The work possesses a high value for architects.

HOW TO KNOW JAPANESE COLOR PRINTS. By Anna Freeborn Priestly. 78 pp., 7 x 10 ins. Price \$5 Net. Doubleday, Page & Co., Garden City and New York.

STUDY of Japanese color prints is one of those subjects which beguile and lead one into interest unawares. Long scorned by the upper classes of Japan, the color print was beloved by the masses of the common people; it was indeed a “popular art,” a “mirror of the floating world,” and in the print there were portrayed the happenings of the day,—the life of the crowded city streets, or in some of the most beautiful prints, the mystery of gorges or mountains under snow. In common with the rest of the discriminating world, the Japanese now value these characteristic expressions of their national art, and they are buying back, often at high prices, the prints which a few years ago they parted with for a song.

This work seems likely to widen if not to greatly deepen interest in Japanese color prints. The author in preparing her text seems to have leaned rather heavily on Mr. Fenollosa and Mr. Ficke, though possibly there is little which could be added to the knowledge which the researches of these writers have made possible. One useful detail is the inclusion of a glossary, defining terms used.

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. “Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use.”



THE text of this work dwells in detail upon the working of concrete; details of construction; continuous vertical support; verticality; monolithic concrete; concrete vaulting; textures; “crazing”; and treatments; and other subjects of importance to the architect, engineer or builder concerned with concrete. It sums up and presents the experience of many successful workers in concrete construction. The volume deals with concrete and with its design as influenced or governed by its construction. Its authors have been fortunate in selecting admirable examples of the use of the material, and the work contains, among a large number of illustrations, views of residences, tall structures such as hotels, theaters, power houses, or office buildings; bridges, aqueducts, retaining walls and walls of other kinds. The views are of work in more than one country, for there are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States

Text and 100 Plates; 8½ x 11 ins. Price \$10

ROGERS & MANSON COMPANY, 383 MADISON AVENUE, NEW YORK

THE EDITOR'S FORUM

A NEW TRAVELING SCHOLARSHIP

ANNOUNCEMENT is made of a competition for the selection of a beneficiary for the A. W. Brown Traveling Scholarship, this competition to be held under the direction of a committee of the American Institute of Architects. Programs will be mailed to approved applicants about March 19, drawings to be delivered on May 7, 1928. This scholarship is the gift of the Ludowici-Celadon Company and is a memorial to the late A. W. Brown, who was for many years the president of that company and a leader in the manufacture of roofing tile. The value of the scholarship is \$2,000, to be used toward defraying the expenses of a year of travel and study in Europe by a worthy and deserving architect or architectural draftsman. Traveling expenses between the winner's place of residence and the port of New York will be paid in addition to this amount. An award of \$250 will be made to the competitor whose design is placed second.

Under the terms of the gift, the selection of the beneficiary of this scholarship is to be made by means of a competition to be held under the direction of a committee, the drawings to be judged by a jury of from three to five practicing architects chosen by that committee. The general requirements of the problem given for the competition shall be similar to those of the Class A problems issued by the Beaux Arts Institute of Design, but the jury shall give due consideration to the personal qualifications of the competitors as well as to the excellence of the designs submitted in the competition. It is further stipulated by the donors that the competition shall be open to any architect or architectural draftsman who is a citizen and resident of the United States, who has never been the beneficiary of any other European scholarship, who has passed his 22nd but not his 32nd birthday on May 1, 1928, and who has been in active practice or employed in the offices of practicing architects for at least six years, or if a graduate of an architectural school has had two years since graduation. The beneficiary will be required to complete, during his European study, at least two *envois*, which shall consist of measured drawings of buildings on which burnt clay has been used for roofing. Other than this there will be no restrictions as to the type of architecture that shall be studied or the type of work that shall be done, except as the committee may deem it necessary to advise from time to time in order that the intention of the establishment of the scholarship may be realized. Those wishing to compete should secure application blanks from William Dewey Foster, at 10 East 47th Street, New York.

A GUY LOWELL SCHOLARSHIP

IN memory of the late Guy Lowell there has been instituted an annual scholarship of the value of \$1000 for the benefit of architectural draftsmen desiring foreign travel and study. The competition is open to draftsmen between the ages of 21 and 29, who are also citizens of the United States, who have had at least three years' experience in architects' offices, and who have not been beneficiaries of other traveling scholarships. The competition for 1928 is in the nature of a week-end sketch problem to be conducted April 28-29. The program will be given out at the same time throughout the country, and will be issued at five o'clock on a Friday afternoon, the drawing to be completed by nine o'clock the following Monday morning. In each case the work will be conducted under the supervision of an architect, and is to be performed without outside help or criticism, in an attempt to secure work that shall be in every way representative of the individual applicant's own capacity. A jury of award will be appointed by the committee in charge to consider the drawings submitted, and the final award will be made on the basis of the judgment thus rendered. The committee which is governing the competition consists of Edward S. Hewitt, Henry P. Richmond, and William Emerson, chairman, Mr. Richmond being in active charge, at 12 West Street, Boston.

PRINCETON ARCHITECTURAL PRIZES

TWO competitive prizes of \$800, in the School of Architecture, Princeton University, are announced. The prizes will be awarded to the winners of a competition in design to be held from May 21 to May 31, 1928. The candidates shall be unmarried male citizens, not less than 21 nor more than 30 years of age on September 1, 1928, and shall have been employed as draftsmen for not less than three years. Applications to compete for the prizes must be filed on or before April 18, 1928.

ROTCH SCHOLARSHIP COMPETITION

PRELIMINARY examinations for the annual Rotch Traveling Scholarship will be held this year on April 2 and 3. The candidate chosen will be awarded the scholarship for a term to be determined by the committee, but not for more than two years. The scholar will receive \$2,000 for one year or \$3,000 for two. The Boston Society of Architects has yearly offered a prize of \$100, which has been awarded to the candidate placed second, on the recommendation of the committee. Further information regarding the details of the scholarship may be had of C. H. Blackall, 31 West Street, Boston.



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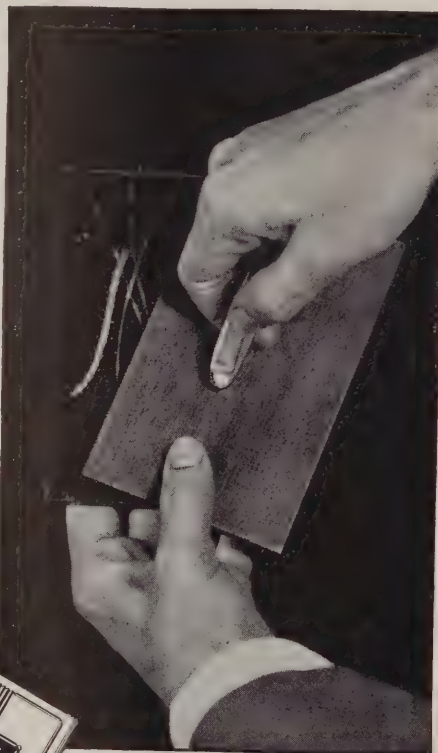
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QUARTERLY REFERENCE NUMBERS

IN August, 1922 THE ARCHITECTURAL FORUM published the first of its Quarterly Reference Numbers. Since then 22 of these numbers have appeared, and the first cycle has been completed. The subjects starting with the present issue, devoted in its entirety to Schools, will be repeated, thus bringing the architect up to date on the major developments which have taken place in the intervening six years.

The classes of buildings to be covered are Banks; Country Houses; Hospitals; Industrial Buildings; Hotels; Churches; Shops and Stores; Office Buildings; Apartment Hotels; Golf and Country Clubs; Motion Picture Theaters; Apartment Houses; University Buildings, in two parts; Small Houses; Club and Fraternity Buildings; Memorial Structures; Automotive Buildings; Public Buildings, in two parts; and Libraries and Museums.



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THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER THREE

MARCH 1928



FUNDAMENTALS IN PLANNING SCHOOL BUILDINGS

BY

WILLIAM B. ITTNER, ARCHITECT

PRESENT-DAY educational objectives,—health, the fundamental operations, citizenship and worthy home membership,—constitute the initial considerations and the all-important fundamentals in present-day school house planning. These objectives have been generally accepted as goals of education, and school communities of the country have reorganized and expanded their curricula in order that these objectives may be brought to realization. Concretely stated, city and town schools are offering physical education and health activities, expanded science courses and social studies, a variety of workshop activities, diversified music and art courses, and many kinds of work that relate directly to home enrichment. Yet, although practically all school communities have expanded their educational programs in line with the comprehensive objectives, no two curricula are alike. Some schools, especially in industrial communities, stress vocational activities; some give far more time and attention to health and physical education than others; some place emphasis on music and art and the formal classroom work.

School building policies, as well as educational programs are variable. In many communities, the tendency toward centralization, viz., the building of larger and fewer schools, prevails; in other words, the policy of combining all grades in one school is dominant. For instance, Gary, Indiana has pursued this complete school plan for the past 20 years. Greenfield, Ohio and Longview, Washington have recently adopted the policy. In most cities and towns, however, there is still much segregation of grades into elementary, junior and senior high schools.

The Test of the School Architect of Today. The real test of an architect's ability to plan schools rests principally on his skill in adapting a building plan to a particular program, so that the building will give 100 per cent educational service. The variation in curricula, in methods of school procedure and in building policies, makes every school building an individual problem. Every building plan is or should be the result of the creative thought of the architect. An attempt to standardize a school building plan is as absurd as an attempt to standardize painting and sculpture. Standards have been developed as guides

to safety, lighting, ventilation and sanitation of schools. These are of service to the less experienced architect. To the master school house planner, however, the mechanical elements are incorporated in the plan almost unconsciously. He knows them so well that they are really in the background of his thought, just as proportion, balance and symmetry are automatic with the skilled artist. If a school building plan is successful in meeting the diversified educational program, if the building gives maximum educational service, safety, good lighting and ventilation, economy and beauty should follow as a natural outcome. On the other hand, a building may conform to every rule for the mechanical elements and be a failure as an adaptation to the educational program.

The School Architect and the School Superintendent. A school architect cannot be expected to interpret the curricular offerings and proposed organization of individual schools. He may know in a general way that physical education, the fundamental operations, shop work, music and art are offered. He may know that auditorium work for special groups is desired. But he doesn't know how classes are to be grouped for the diversified activities, nor about the time allotments. He must depend on the superintendent and his assistants for the interpretation of the curriculum and operating program. The educationists and the architect together must evolve the extent of health and recreational quarters, the number, sizes and correlation of classrooms, laboratories, shops, home economics quarters, auditoriums, music and art rooms. Following this preliminary study, the building becomes almost entirely the architect's responsibility. His chief problem consists of weaving all the requirements into an ensemble plan that will function educationally and at the same time stand as an engineering and architectural success.

Important Considerations in Plan Development. There are several elements that must be considered in developing a school plan from a list of educational requirements. The first of these is climate. The general type of plan, height of building, lighting and ventilation, size of health quarters and kind of building materials are all affected by climate. In the South and in California, for instance, the plan should be



Exterior View and Library, Complete School Group, Greenfield, O.

William B. Ittner, Architect

as open as possible. The building may be one or two stories in height; less window area will be required, and window ventilation may suffice for the entire school year. The health quarters may be minimized, due to the all-year-round out-of-door play. Construction, although durable and fire-resistive, may be lighter. The architecture should exhibit the influence of the traditions of that part of our country. In the Middle West, North and East, school building plans are of a more compact type. As a rule, they cannot be spread out as much as in the warmer climates, owing to the long runs of heating pipes and to the large areas of exposed wall surface. The buildings are usually two or three stories in height, the window areas should be greater than in the South, and full indoor health facilities are essential. Window ventilation, except occasionally, is not practical. The most efficient type of heating and ventilating apparatus becomes a requirement. Construction must be heavier, brick being the preferred material. The architecture in most cases becomes an adaptation of Colonial, Tudor or Georgian.

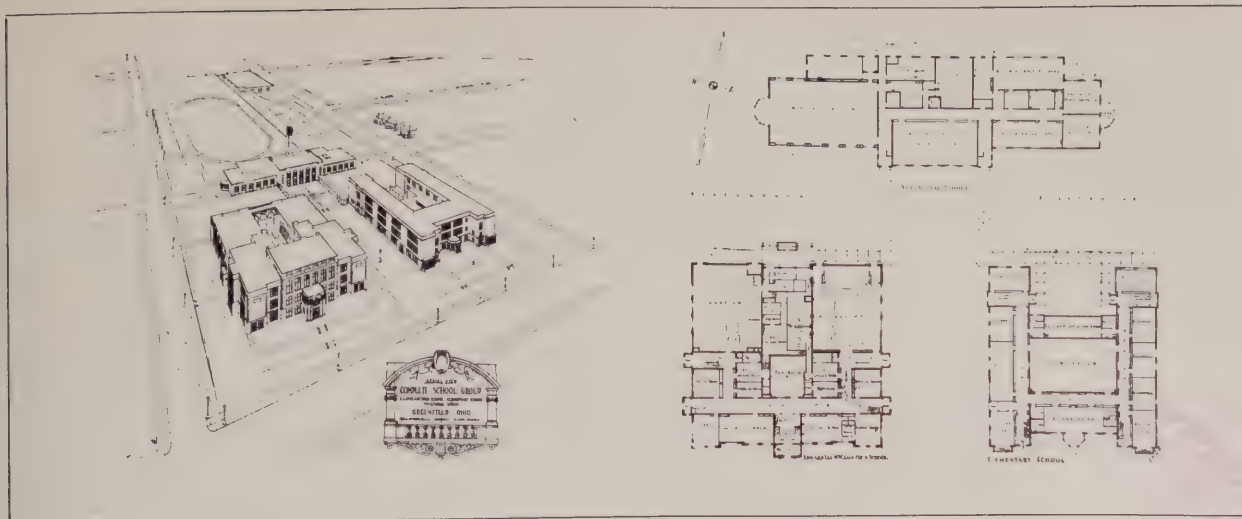
Site conditions constitute a second important consideration in planning of schools. A restricted site calls for a closely knit plan and additional height. These plan requirements bring about diverse problems in safety, lighting and ventilation aside from the problem of the varied educational quarters. Frequently the site is of sufficient size for an "open plan," two-story building, but it may have peculiarities of grades and an abrupt slope. Such a situation will present an entirely new problem of planning for educational service in addition to the mechanical and architectural features of the building. A consideration which architects are altogether too likely to overlook or neglect is that of plan elasticity and possibilities of expansion. School buildings today are fire-resistive and durable. Most of them will stand the test of a century. Educational thought and practice, however, are constantly changing, and enrollments will increase from year to year. Possibilities for expansion and alterations should be inherent in every original school building plan. Wherever

possible within the building, units should be planned so that they can be enlarged or decreased in size. The locations of supporting walls, the arrangement of the classroom units and the grouping of special rooms all have an important bearing on the matter of elasticity of building plan.

Classification of American Schools. American public schools are classified generally as rural, elementary and secondary. There are variations of these. The rural school may be a one-room school or a consolidated school, serving several rural districts. The elementary schools include the first six, the first seven or the first eight grades and kindergarten. Secondary schools include four or six upper grades. If the latter, they are designated as junior-senior schools. There are also secondary schools known as technical high schools and vocational high schools. In several of our largest cities, high schools have been segregated into separate buildings for boys and girls.

The Rural School. The ideal rural school situation is represented by the centralized complete school at Greenfield, Ohio (page 306). Greenfield has a population of about 6,000. It is surrounded by a rich agricultural country. The one complete school, centrally located and with playground immediately adjacent, serves not only the children of the town but the children from 17 rural districts. At this school the children may enjoy an enriched education in a beautiful environment, under the influence of a high type of teacher, and still live in the country and enjoy God's great out-of-doors. Greenfield has set an example which may well be followed by the small towns of our country. The three-building school group at Greenfield serves a district of approximately 100 square miles in extent and has accommodations for 2,200 students from the kindergarten through the high school. The school population is now 1,800. One thousand, two hundred of these students belong to Greenfield; the remaining 600 are transported from the 17 adjacent rural districts in motor buses. There is thus a leeway for growth of 400 students.

For its program of health the schools include:



Perspective and Plan, Complete School Group, Greenfield, O.

William B. Ittner, Architect

1. A high school gymnasium (65 x 90 feet) provided with seating capacity for 1,000 spectators, locker and shower rooms and accessory rooms for home and visiting teams.

2. An elementary school gymnasium (52 x 80 feet) for grades three, four, five and six and a play-room for the youngest children in grades one and two.

3. Two tile-paved, open-air gymnasiums, each 90 x 60 feet, and an athletic field with provisions for all major out-of-door sports,—football, baseball, track and tennis.

4. A swimming pool (32 x 75 feet),—the largest ever installed in a public school building,—equipped with ultra-violet ray process for water purification. The pool room expands into a sun parlor at one end, and provisions have been arranged for 800 spectators. A laundry and a full complement of lockers and showers make up the accessories.

5. A home hygiene room and adjacent clinic for examination, first aid, and for instruction in cleanliness, sanitation and home nursing.

6. A cafeteria seating 250 at a time, for those who remain at the school all day.

The accompanying plans illustrate the arrangement of the facilities for the fundamental operations:

1. In the elementary school, the kindergarten, which is a double unit (22 x 50 feet).

2. Eighteen classrooms, each with dimensions 22 x 32 feet. Owing to the organization of the elementary school on the work-study-play plan, only half the usual number of classrooms are required.

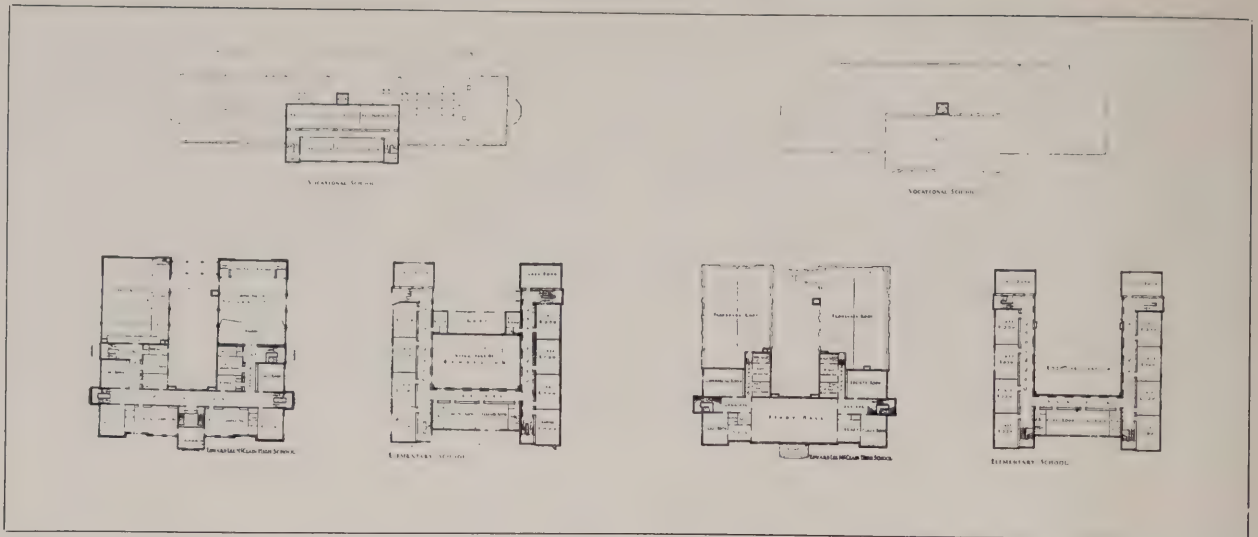
3. The ten classrooms in the high school are varied in size, owing to the variation in size of classes.

4. There are two libraries, a small room accommodating 70 pupils at a time in the elementary school, and a large room (42 x 82 feet) in the high school.

The high school library (page 306) is probably unrivaled as a beautiful room for its purpose. The plan, the unusual proportions and the lighting give it charm and an atmosphere of cheerfulness and

spaciousness rarely achieved. The walls, a neutral tone, are book-lined on three sides. A number of Caproni casts appear in appropriate settings, and the upper end panels have been embellished by two of Vesper Lincoln George's murals. For the purpose of socializing and integrating the work of the school, two auditoriums are provided,—one for daily auditorium work with small groups is located in the elementary school, and the other, with capacity for 1,000, including a large stage and equipped with motion picture machine, radio outfit and magnificent pipe organ, is located on the main floor of the high school. Two of the three buildings of the Greenfield group,—the high school and the vocational building,—are the gifts of E. L. McClain, citizen-philanthropist of Greenfield. The elementary unit for the first six grades and kindergarten was erected by the board of education. Mr. McClain equipped all three of the schools. His gifts of sites, and athletic field, murals, paintings and sculpture are in addition to the two buildings and equipment. The combined cost of the three buildings without grounds and equipment approximates \$950,000, yielding a per-pupil cost of \$432, as the school plant will normally accommodate 2,200 students. When consideration is given to the fact that there are schools in the country with \$1,000 per pupil costs, not offering the enriched educational opportunities described, the significance of the Greenfield school is apparent.

At Deering, Missouri is an example of consolidation on a small scale. This school is located in a village and serves as the center for the educational and community activities of the district. Although the accommodations of such schools are limited, the quarters may be planned for multiple uses. In the Deering school (page 312) we find a small auditorium which must also serve as the health and cafeteria units, and a limited number of class and special rooms planned and equipped for a variety of uses. The school has a capacity of 360 pupils and was



Plans of the Second and Third Floors, Complete School Group, Greenfield, O.

William B. Ittner, Architect

erected at a cost of \$58,200 or about \$162 per pupil.

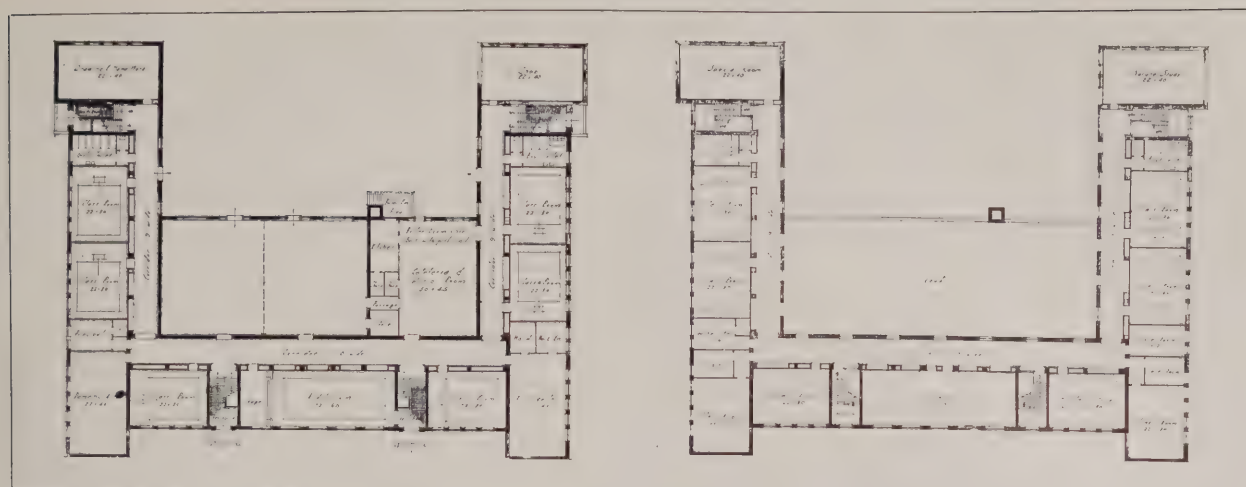
The Present-Day Elementary School. The greatest changes in education have probably taken place in the elementary school field. Elementary schools used to be groups of classrooms with perhaps a basement playroom and occasionally a small auditorium which was used only on rare occasions. The buildings were badly planned, improperly lighted, poorly constructed, and most of them were stiff, unattractive, box-like structures. The country owes a debt of gratitude to Dr. William Wirt of Gary, Indiana more than to any other individual for the enriched education the masses of our children are enjoying today. The work-study-play plan evolved by Dr. Wirt has served as the administrative device in making the enriched elementary school financially possible for all school communities. The curricula of elementary schools organized on the work-study-play plan call for health quarters, auditoriums and special rooms for elementary science, handwork and music, in addition to classrooms, but only *half* of the usual number of classrooms are required. A large number of cities and towns of the country have reorganized their elementary schools on the work-study-play or "platoon" plan. The cities include Pittsburgh, Detroit, Dallas, Birmingham, Alabama, St. Paul, Greenfield and Dayton, Ohio. One point about this reorganization is interesting. Although all of these cities have used the same administrative plan as a guide, no two schools are alike. At Birmingham, a typical elementary school plan was developed to serve as a guide for the erection of new schools organized on the work-study-play plan. Yet there were no duplicates. Every school situation presented individual problems of site, pupil enrollments, and variation in curricula and methods.

The typical elementary school plan for Birmingham is interesting. After a survey of building needs, Birmingham re-zoned the school city and adopted the policy of having fewer and larger ele-

mentary schools. School units of 1,000 to 1,500 pupils became the basis for the re-districting. Consideration was given to 5-, 10- and 15-year growth. In other words, the school enrollment of a new district at the time of the survey may have been but 500. If the prognostication of growth, however, revealed a school population of 1,000 or more in less than a decade, the typical 1,000-pupil school plan was decided upon for that district although only a section of the building was immediately erected. The typical 1,000-pupil school was planned so that it could be erected in three sections; first the center portion, followed by the wings when enrollments demanded enlargements. The 1,000-pupil school contained a kindergarten, 14 classrooms; a small auditorium; a library; a room for domestic arts, drawing and handwork; nature study and music rooms, and a shop for boys. A playroom was arranged for two classes at a time, and the cafeteria opened upon the playground. The cost of the typical building complete was \$225,000, at a per capita cost of \$225.

With the traditional plan of organization, about 26 classrooms would have been required for 1,000 pupils. A reference to the plans (page 309) reveals the fact that although only 14 classrooms are provided, the total operating capacity of the special rooms is equivalent to about half the enrollment. This fact demonstrates a working principle of the work-study-play plan by means of a departmental operating schedule which rotates classes from classrooms to special rooms at periodic intervals. Approximately one-half the school is studying in classrooms while the other half is working in the special rooms. Only half the usual number of classrooms therefore are required. It is for this reason that the work-study-play schools can offer children an enriched school life at approximately the same cost as that of the restricted, purely classroom school of the past.

The Goliad School, Galveston (page 310) is an example of the enriched elementary school, organ-



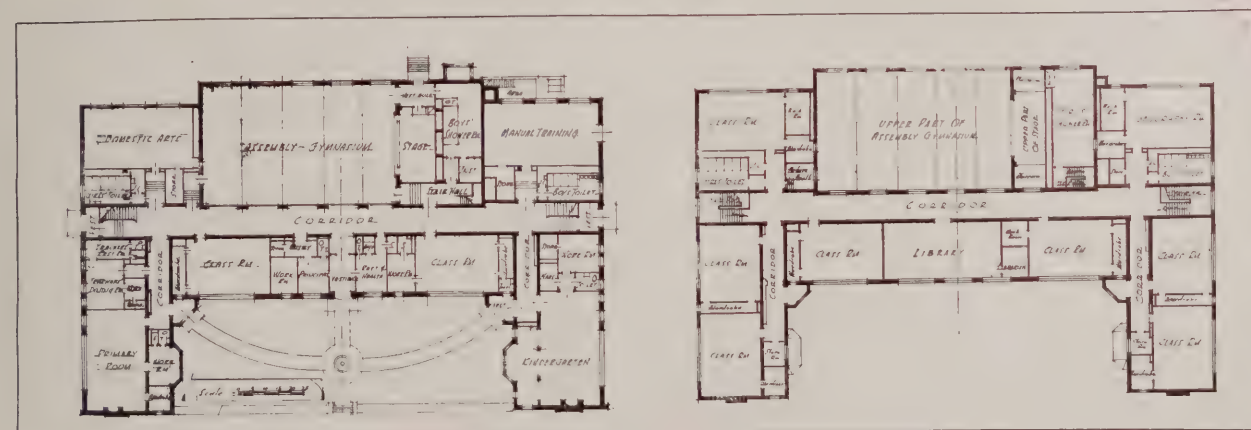
FIRST FLOOR

SECOND FLOOR

GRADE SCHOOL, BIRMINGHAM, ALA.
WILLIAM B. ITTNER, CONSULTING ARCHITECT



GENERAL VIEW



FIRST FLOOR

SECOND FLOOR

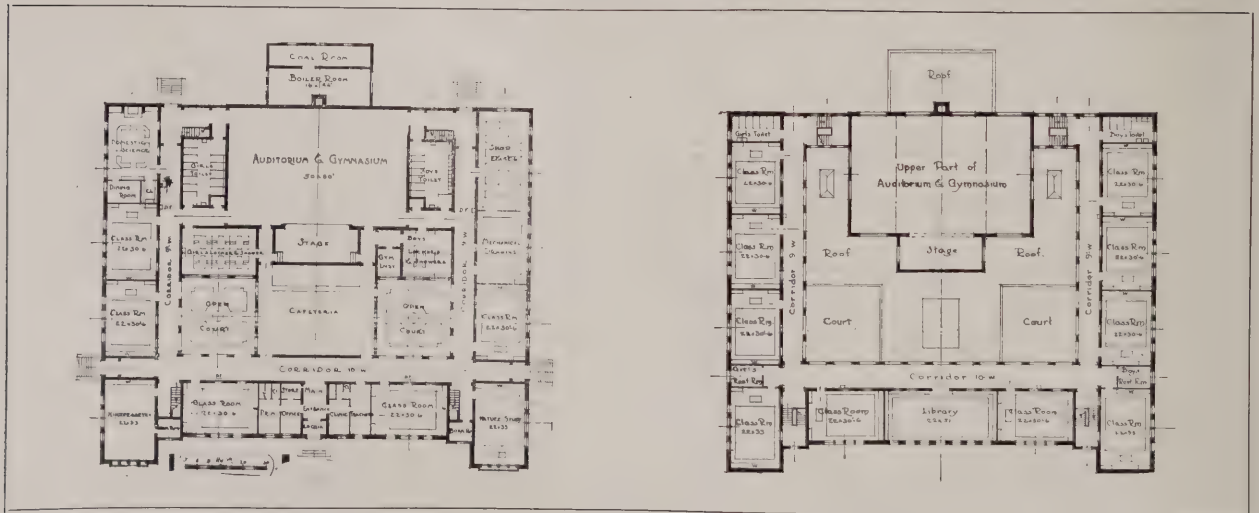
JEFFERSON ELEMENTARY SCHOOL, BATTLE CREEK, MICH.
WILLIAM B. ITTNER, ARCHITECT



GENERAL VIEW



MAIN ENTRANCE



FIRST FLOOR

SECOND FLOOR

GOLIAD ELEMENTARY SCHOOL, GALVESTON

WILLIAM B. ITTNER, DeWITT & LEMON, ASSOCIATED ARCHITECTS



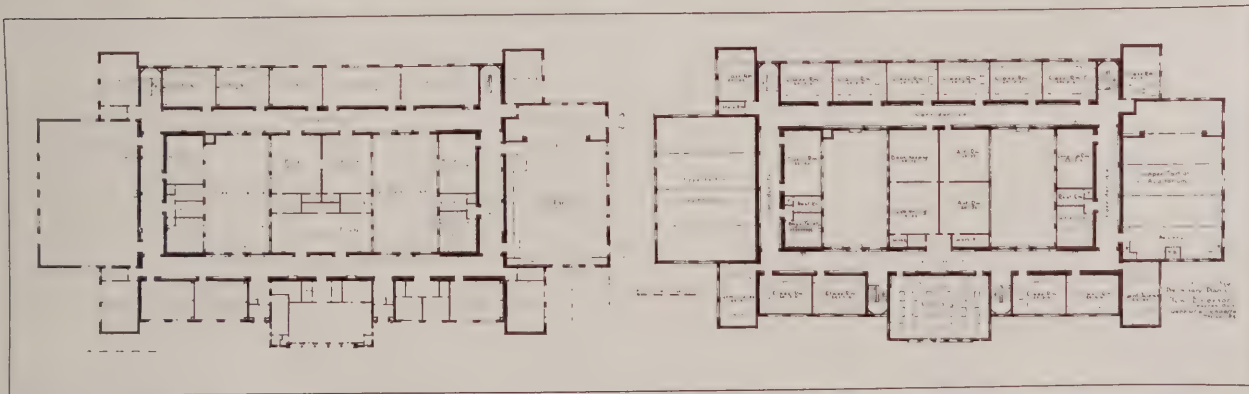
GENERAL VIEW



GYMNASIUM



BOYS' GENERAL SHOP



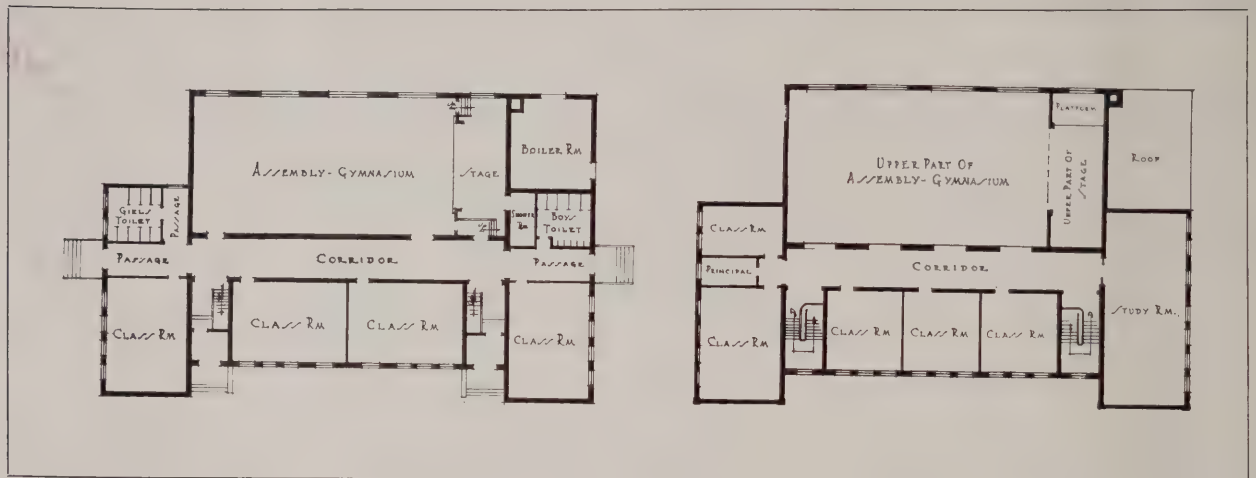
FIRST FLOOR

SECOND FLOOR

EMERSON ELEMENTARY JUNIOR HIGH SCHOOL, DAYTON, O.
WILLIAM B. ITNER, GEBHARDT & SCHAEFFER, ASSOCIATED ARCHITECTS



Pen and Ink Perspective Drawing



First Floor

Second Floor

Grade School Building for Deering, Mo.

William B. Ittner, Architect

ized on a modified work-study-play plan. The climatic conditions prevailing in this gulf port city find expression in a building erected around two open courts or patios, upon which the corridors open to the fullest extent. The desire for maximum air circulation results in giving the auditorium-gymnasium windows on all sides. Windows on the inner walls of all class and special rooms give maximum air circulation to pupils at study or work. As the educational program did not include auditorium work as a daily performance, a combination auditorium-gymnasium was planned for this school with locker and shower accessories. A cafeteria was arranged in correlation. An elementary shop for boys; a domestic arts room for girls; a nature study room and a library-literature room, complete the educational facilities of this school in addition to the classrooms. Like many other buildings in this section of the country, the exterior is designed in the Spanish tradition in stucco and trimmed with polychrome terra cotta. The build-

ing complete, without equipment and architects' fees, cost \$220,000. The normal capacity of the building is 830 pupils, making a per capita cost of \$265.

The Jefferson Elementary School, Battle Creek, Michigan (page 309), although an enriched school differs fundamentally from the Goliad School at Galveston. The plan is of a more compact type. Here again, the climatic conditions have had an underlying influence upon the plan. The difference in the architectural expression of the two buildings is also interesting. The school is unusual in the fact that six of its classrooms are provided with small auxiliary work or classrooms for use by small groups of pupils in special or project problems. The individual classroom plan at this school shows what effect a variation in classroom method will have on a building plan. Besides the auditorium-gymnasium, with its locker and shower facilities arranged for community as well as school uses, the building provides an elementary shop for boys; a domestic arts room



General View



First Floor

Second Floor

Peckham Vocational School, Buffalo

William B. Ittner and Ernest Crimi, Associated Architects

for girls, and a library-literature classroom. The school accommodates 600 pupils and was erected at a cost of \$236,473, exclusive of equipment and architects' fees, or \$395 per capita.

Secondary Schools

The Junior High School. This school includes the seventh, eighth and ninth grades. There is not a great difference in the planning of junior and senior high schools. The difference is really one of scope and emphasis. The health and recreational quarters of the junior school are not as extensive as in the senior. The laboratories are for general science only, while in the senior school they are specialized. As a rule, departmentalization is not as highly developed in the junior as in the senior school. With the advent of the enriched elementary school and the work-study-play plan of organization, the need for the segregated junior high school has materially diminished. A plan of combining the enriched elementary school

with the junior high school has been carried out at Dayton, Ohio with signal success.

The Emerson School at Dayton, Ohio (page 311) was originally planned as an elementary school for 1,462 pupils and for the work-study-play or "platoon" organization. It was discovered, however, that by the addition of three special units the capacity of the school could be expanded to 1,640 and the junior grades could be included and given all the facilities called for by their courses of study. The units added were two general science laboratories and the commercial suite. The physical education, the library, the auditorium, the home economics and shop quarters had already been included in the plan. The Emerson School is a notable example of a building planned to a carefully prepared work-study-play schedule. Thoughtful educational planning on the part of the superintendent, coupled with skillful structural planning on the part of the architect, enabled the board to turn back \$165,000 of the amount

appropriated for the building. The plan is interesting from the point of pupil circulation and the location of the special quarters. Site peculiarities necessitated the location of the health quarters on one side of the building and the auditorium on the other, as the plot was long and narrow. The auditorium is arranged with separate entrances, and the stage is planned so that it can be used as a classroom. On the first floor may be noted the unit arrangement of the home economics, small gymnasium and play courts. On the second floor, the distribution of the classrooms and laboratories, the size and location of the library and special rooms are points of interest. The building cost complete was \$498,000, exclusive of equipment and architects' fees, at a per pupil cost of \$314. Many cities segregate the junior high school into separate buildings. At Jacksonville, Florida two segregated junior schools similar in plan and size have been erected.

Junior High Schools, Jacksonville,—two junior high schools,—recently completed, are representative of various ramifications of buildings of this type. In this case the buildings are three stories in height and are built around open patios. The corridors encircle each building, giving maximum circulation and egress. The auditoriums and gymnasiums find their places at either end of the buildings, convenient for the community use of the one and accessible to playgrounds for the other. The shops, all of generous sizes, are grouped upon the first floors, the study rooms and libraries on the intermediate floors, and laboratories for science and domestic arts, together with the cafeterias, are grouped upon the third floors. Each building accommodates 1,700 pupils and was erected complete, excluding equipment and architects' fees, for \$555,000, at a per capita cost of \$326.

Senior High School. These schools (grades 10, 11 and 12) represent what might be termed the last word in educational expansion. They cause the greatest per capita drain on the taxpayer, and the reasons are obvious. First of all, the sites must be large, owing to the athletic requirements. Next, it is scarcely possible to plan for definite class groups, owing to the large number of electives and collateral courses. Furthermore, the accessory units for all the various departments are most extensive. In some senior high schools the studies of the first two college years have been absorbed. The college course addition has no particular influence on the plan. Any well planned senior or four-year high school includes all the facilities required for junior college work.

The Senior High School-Junior College, Muskegon, Michigan (page 317) is one of a group of four buildings centrally located. An athletic field and stadium are adjacent to the school grounds. The outstanding features of this building are its auditorium-gymnasium stage and health quarters. The auditorium seats 1,300. With the steel curtain separating stage and gymnasium raised and the suspended bleachers dropped, additional seating capacity is provided for 500. The health quarters, located on

the ground floor and readily accessible to the play field, consist of two examination rooms; two clinics; a dental room and two corrective gymnasiums. Together with locker and shower rooms for both boys and girls, the physical education facilities can care for 500 at a time. A supplementary auditorium for music and dramatics is located on the ground floor and in close proximity to the large auditorium. This room is unique in its plan and interior treatment. Two practice rooms and a band and orchestra room are also included in the ground floor plan. A cafeteria with 500 seatings flanks one side of the auditorium-gymnasium and is located under the court and top-lighted. It is supplemented by a faculty dining room, kitchen, kitchen store room and rooms for male and female kitchen attendants. Another feature unusual in schools is the museum. The cost of the building complete without equipment and architects' fees was \$704,000,—a per capita cost of \$454.

The High School, St. Petersburg, Florida is an outstanding example of planning for Southern climates. In a community of almost perpetual sunshine, the plan has been opened up to the fullest extent for natural ventilation. Provision for mechanical ventilation is conspicuous by its absence. The height is confined to two stories and is built around two open courts or patios upon which the corridors are entirely open as an arcade. Windows upon the inner wall above the blackboards permit of full cross ventilation to the classrooms. The school health activities, being conducted largely in the open, where ample playgrounds and an open air swimming pool are provided, permit the indoor health facilities to be reduced to a combination stage-gymnasium arrangement. Ample indoor locker and shower facilities are also provided. The building executed in the traditional Spanish is of tinted stucco trimmed with polychrome terra cotta. It accommodates 1,700 pupils and was erected complete without equipment and architects' fees for \$426 per capita.

The Central Technical High School, Columbus, Ohio forms one of a group of buildings comprising the new civic center of Columbus. Being the first building to be erected, it was executed in monumental design in stone, serving to give the keynote for the buildings which are to follow. It occupies a commanding site on the west side of the Scioto River and is flanked on either side by monumental bridges. Its outstanding features comprise a music-lecture room facing two sunken gardens in the forecourt, the main entrance approach being across its roof. This brings the room into a location where it can be turned over for community uses without entrance to the school building proper. Another outstanding feature of the building is an auditorium to seat 1,500 with a double gymnasium-stage combination. The double combination includes a stage 20 feet deep separated from the girls' gymnasium by a steel sound-proof curtain, the boys' gymnasium adjoining the other side to the rear. It is possible by this arrangement to throw the entire health suite together for

pageants, large choruses and the social features of the school. An art group comprising a room for drawing, a room for commercial art, printing, ceramics and art metal work, are grouped upon the uppermost story around an art gallery, all of which are top or gallery lighted. The cost of the building complete, without equipment and architects' fees, was \$1,167,377. The pupil accommodation approximates 1,800, giving a per capita cost of \$592.77.

The Bennett High School, Buffalo represents the full development of a comprehensive high school. Built to accommodate 2,500 pupils and occupying a commanding site, it comprises one of Buffalo's chief educational assets. The building is complete in the educational facilities it furnishes which include: 35 classrooms for academic classes; a group of eight domestic arts rooms; four art rooms; eight science laboratories; ten study rooms; two gymnasiums, a swimming pool; an auditorium seating 2,000, and a supplementary auditorium or music-lecture room, separate cafeterias for boys and girls, each seating 500, and a faculty dining room, seating 70, all served from a common kitchen. The building cost \$1,500,000 without equipment and fees, or \$600 per capita.

The Vocational High School

Present-day high school planning tends toward the incorporation of vocational activities in junior and senior high schools, rather than toward a segregation of trade courses in separate vocational buildings. By providing vocational courses in high schools, all students have the advantage of shop activities close at hand, and those who desire to pursue any certain type of trade may devote to it some school time and all leisure time. In cities that are highly industrial, however, a centralized vocational school is erected in addition to the vocational departments in the high schools. In such schools vocational activities are pursued as trade courses. The plans for a vocational building as a rule make limited provision for the academic or strictly educational quarters of the building, as the students attend other schools of the city, coming to the vocational school only for intensive training in vocational courses.

In the Peckham Vocational School, Buffalo the academic features of the building are confined to a two-story structure containing a limited number of classrooms and laboratories, a combination auditorium-gymnasium and a cafeteria. The remainder of the school consists of large, undivided, top-lighted areas capable of being split up into vocational units as the varying requirements demand. The building was erected complete at a cost of \$462,129, exclusive of equipment and architects' fees.

The Complete School. A concentration of all grades in one school represents a departure from the usual in school building policies. Several small cities have adopted this plan. The arguments presented by the advocates of this plan are:

1. There is no convenient dropping-out place.
2. The enriched facilities of the high school are

available for the younger children when not in use by high school students.

3. The situation is more natural when older and younger students are in personal contact with one another a part of the school day, as, for instance, during recreation and some of the more informal periods of special activities.

The Complete School at Longview, Washington, the home of the Long-Bell Lumber Co., is the gift of R. A. Long, president of the company. This school is planned for 2,800 pupils and includes all grades from kindergarten through the high school. The three building units, the elementary, the junior and the senior high, are located on a 39-acre site. As Longview is in the strictest sense an American city, Colonial architecture was chosen. The center building, the senior high school, houses the school and community auditorium with its capacity for 1,000. Directly behind the auditorium, across the corridor, is the double gymnasium divided by sliding door walls. There is a very definite relationship between the gymnasium and the cafeteria (38 x 164 feet). Although separated by a small court, both units are readily accessible to the public.

The two wings that connect the center senior unit with the elementary and junior schools are part of the senior school and house the vocational and home economics departments. The library-study on the second floor runs across the front and commands a view of the landscaping below. It is an unusual room, 24 x 140 feet, with a capacity of 200 students. Most of the classrooms are distributed on this floor. The junior high school also contains a double gymnasium with complete accessories. There are no shops or home economics rooms in the junior unit, since those provided in the senior high school will serve all students. The library-study overlooks the grounds and has a capacity for 70 students. The art room, 20 x 45 feet, is centrally located on the second floor. A feature of the elementary school is the covered play court in place of a gymnasium. The climate at Longview permits of almost continuous out-of-door play. The kindergarten is planned with a bay and with its own outside entrance. A music room with a small stage is provided, so that it can also serve as an auditorium for smaller groups. The two large classrooms on the second floor are the nature study and handwork rooms.

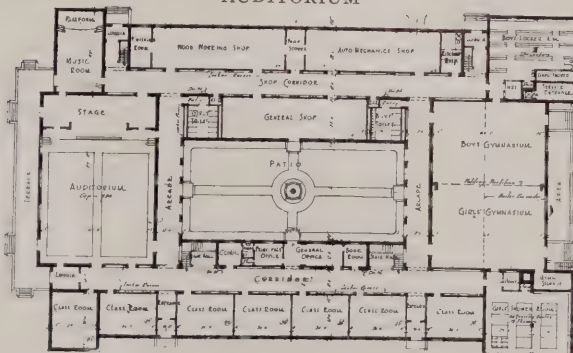
Summary. As educational programs and methods of school procedure are variable factors in school communities, and as building policies, climate and site conditions are also variable, every school building becomes an individual problem. Rules and formulæ can and have been evolved as guides to safety, lighting and sanitation of schools. The real test of the success of a school building, however, is its working efficiency. Therefore, an intimate relationship must exist between the educational plan and the building plan. If a school building renders maximum educational service, the mechanical elements will exist as natural accompaniments.



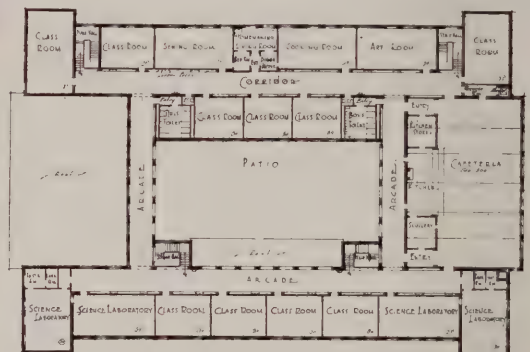
GENERAL VIEW



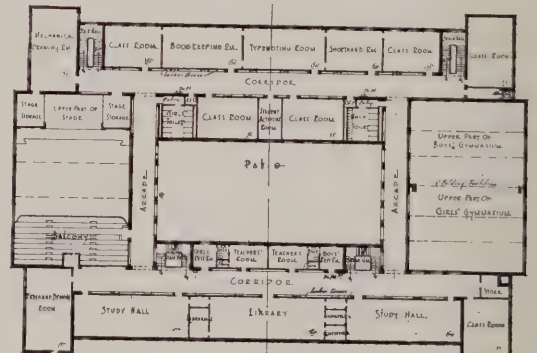
AUDITORIUM



FIRST FLOOR

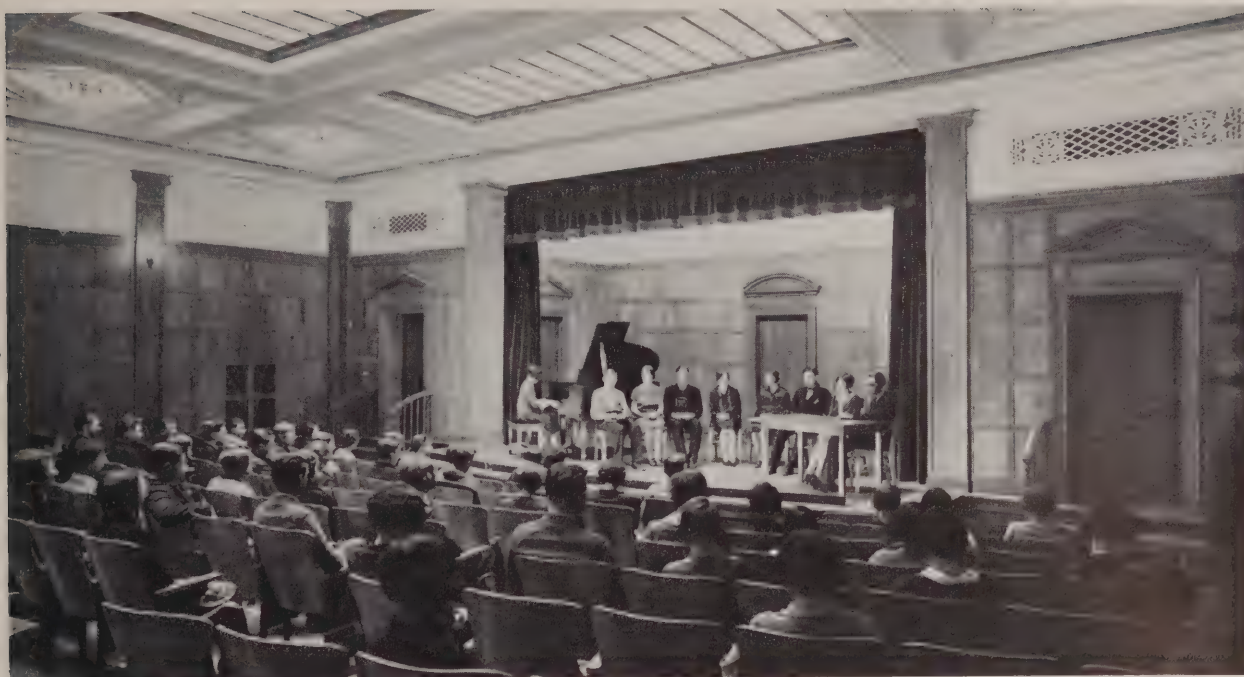


THIRD FLOOR

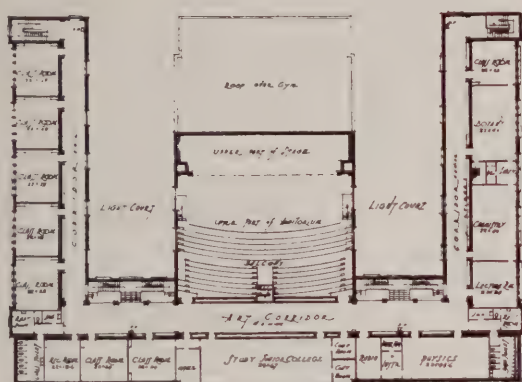


SECOND FLOOR

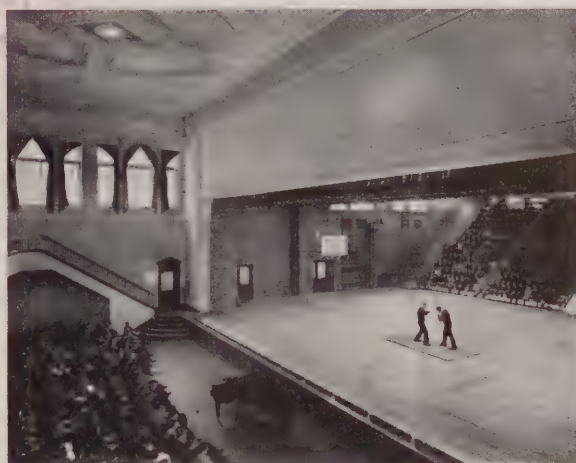
ROBERT E. LEE SENIOR HIGH SCHOOL, JACKSONVILLE, FLA.
 MARK & SHEFTALL, ARCHITECTS; WILLIAM B. ITTNER, CONSULTING ARCHITECT



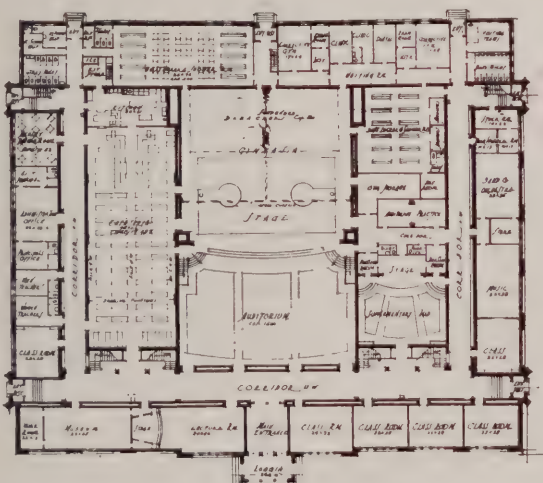
MUSIC EXPRESSION ROOM



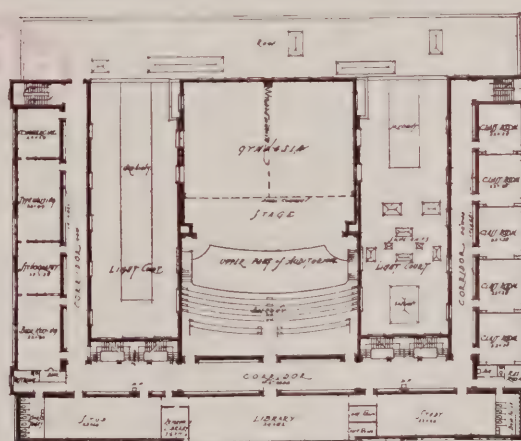
THIRD FLOOR



AUDITORIUM AND STAGE GYMNASIUM



FIRST FLOOR



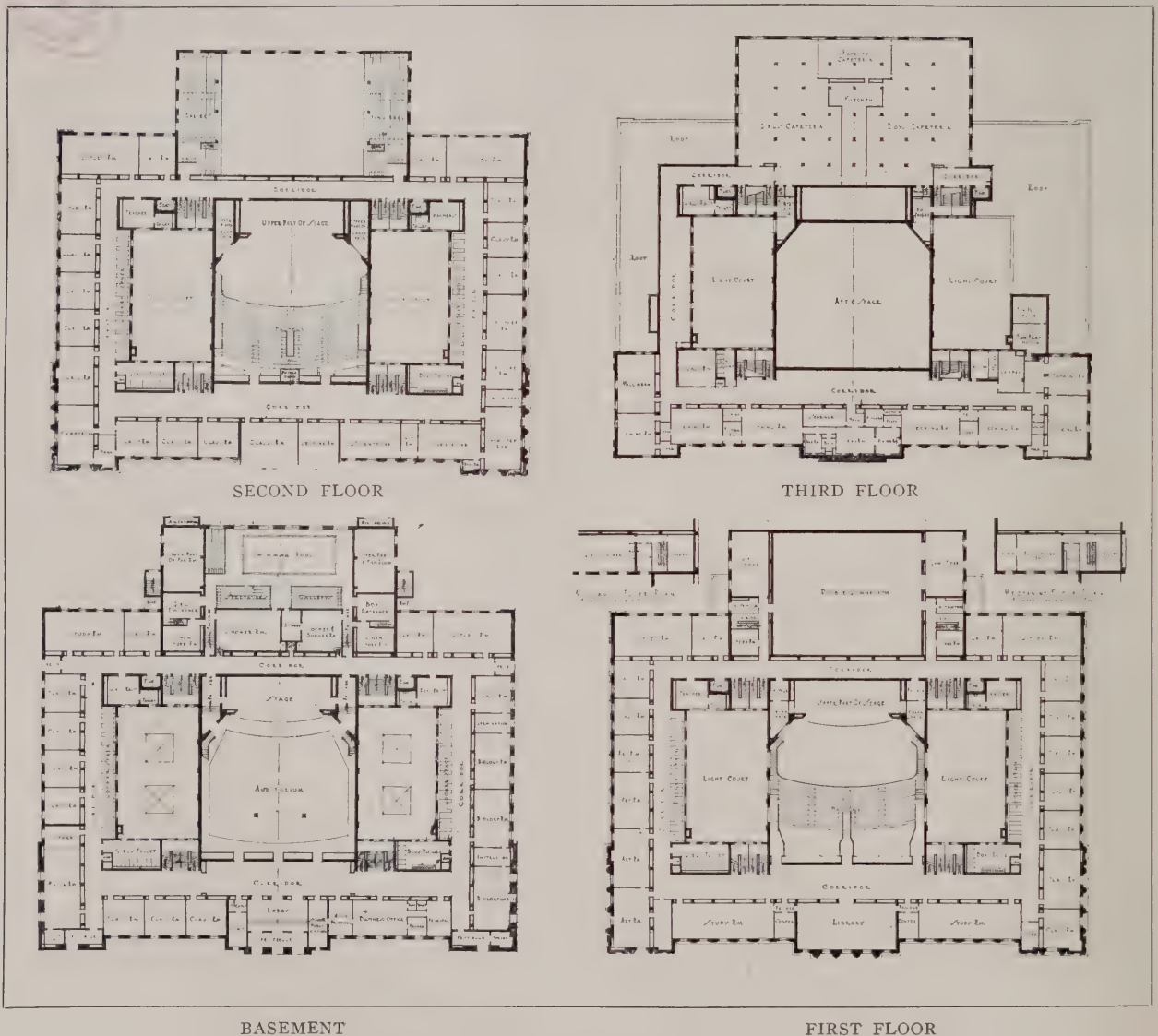
SECOND FLOOR

SENIOR HIGH SCHOOL—JUNIOR COLLEGE, MUSKEGON, MICH.

WILLIAM B. ITTNER, ARCHITECT



GENERAL VIEW

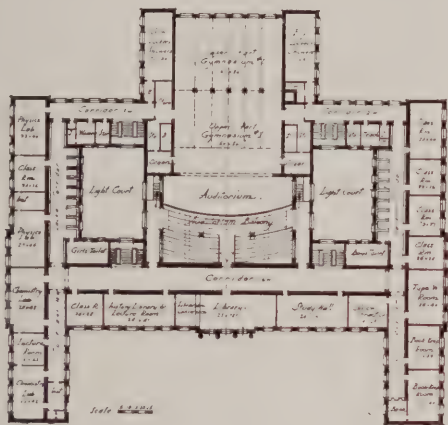


BASEMENT

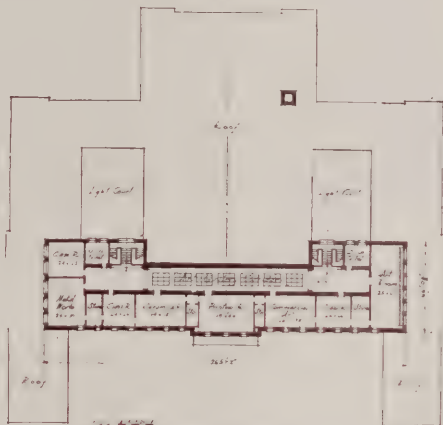
FIRST FLOOR

BENNETT HIGH SCHOOL, BUFFALO

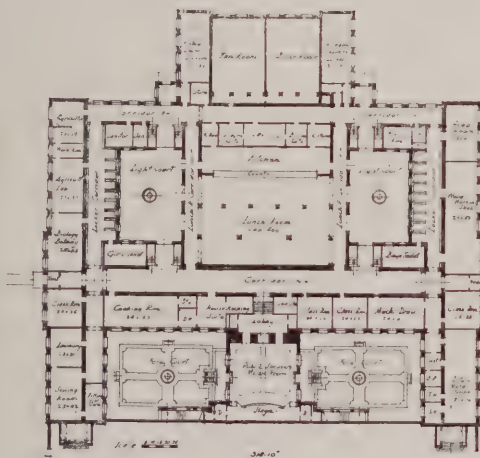
WILLIAM B. ITTNER, ASSOCIATED BUFFALO ARCHITECTS, ERNEST CRIMI, ASSOCIATED ARCHITECTS



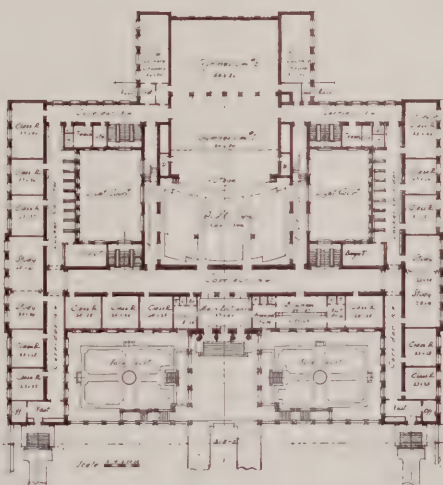
SECOND FLOOR



THIRD FLOOR



BASEMENT



FIRST FLOOR

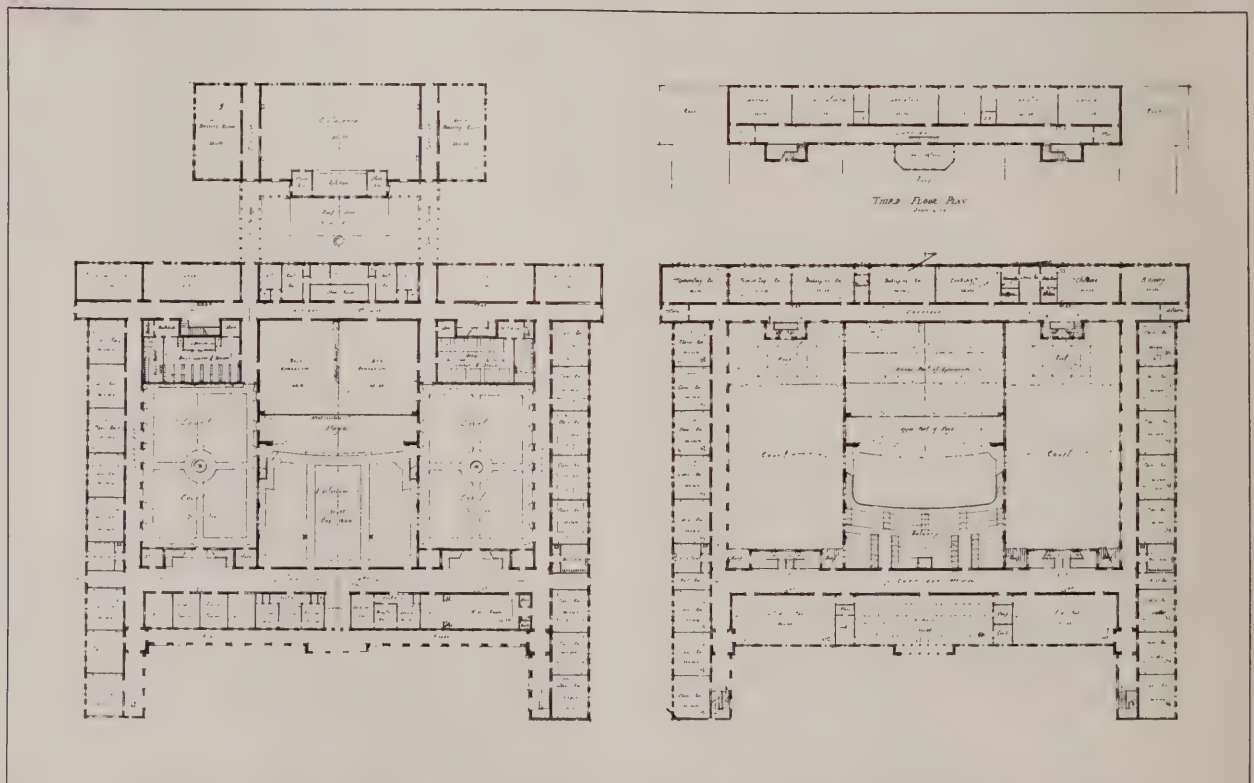
CENTRAL TECHNICAL HIGH SCHOOL, COLUMBUS, O.
WILLIAM B. ITTNER, ARCHITECT



MAIN ENTRANCE



INTERIOR COURT

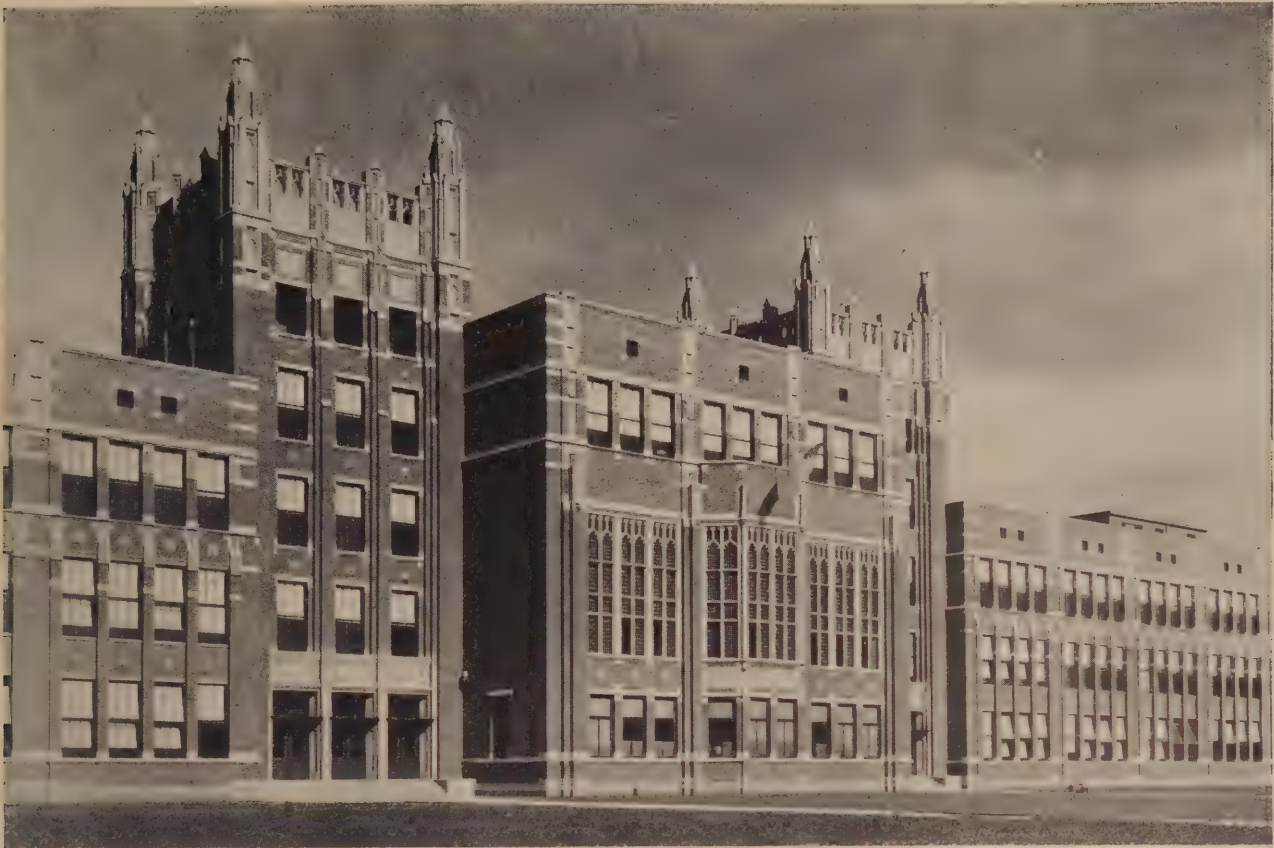


FIRST FLOOR

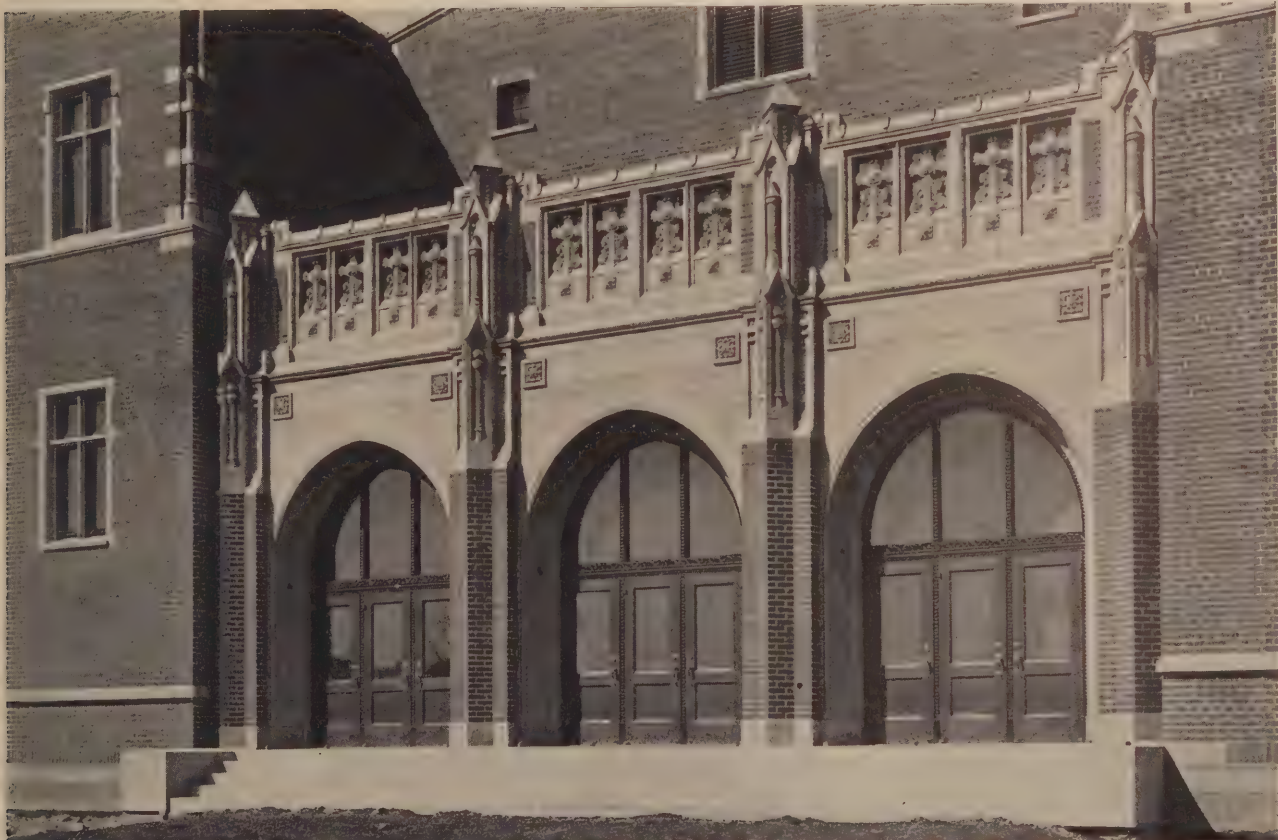
SECOND FLOOR

ST. PETERSBURG HIGH SCHOOL, ST PETERSBURG, FLA.

WILLIAM B. ITTNER AND M. LEO ELLIOTT, ASSOCIATED ARCHITECTS



FRONT ELEVATION



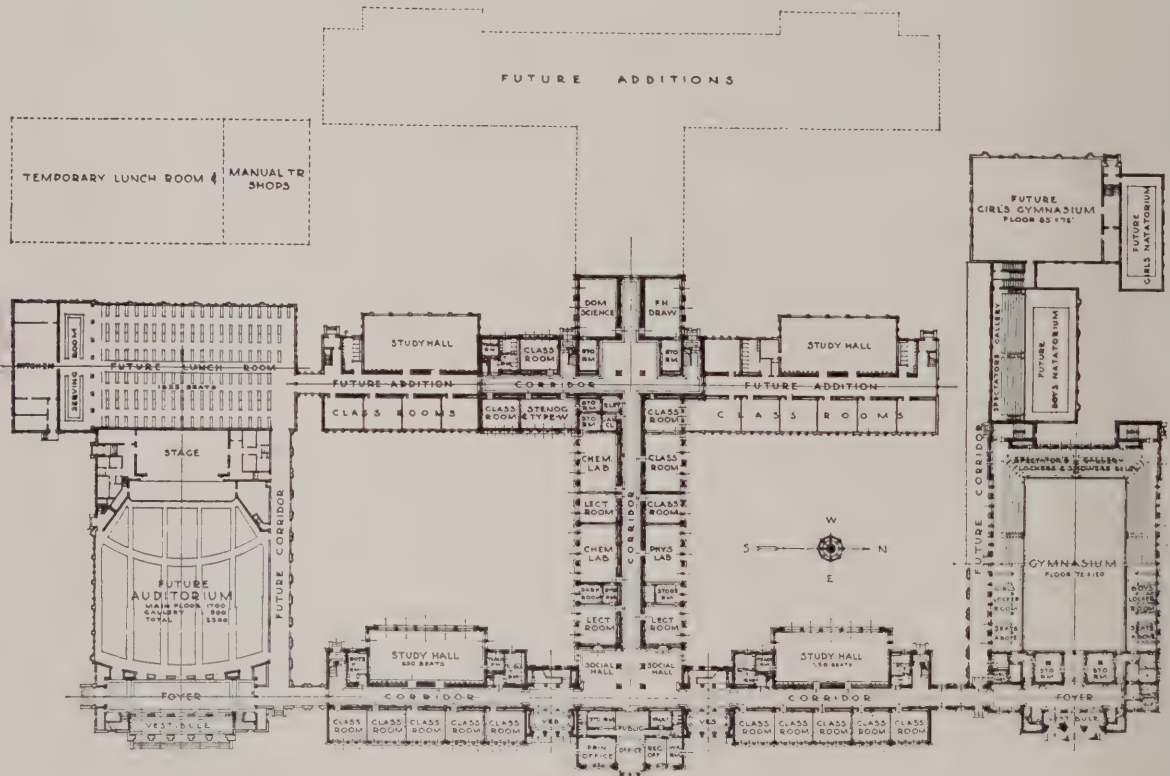
Photos. Chicago Arch. Photo. Co.

Plan on Back

ENTRANCE TO GYMNASIUM
EVANSTON TOWNSHIP HIGH SCHOOL, EVANSTON, ILL.
PERKINS, FELLOWS & HAMILTON AND HAMILTON, FELLOWS & WILKINSON, ARCHITECTS

COST AND CONSTRUCTION DATA

Designed to eventually accommodate 4,000 or more pupils, only a portion of the academic building and the main gymnasium wing have been built as yet. The cost of these units including the power house and the temporary lunch room and manual training shops was approximately \$1,800,000, which on the basis of 1,800 pupils now enrolled makes a cost of about \$1,000 per pupil. The unit cost of both the academic and gymnasium sections with the cost of separate heating plant apportioned to them was 37.1 cents per cubic foot. The exterior treatment is brick trimmed with terra cotta, and the general construction is fireproof.

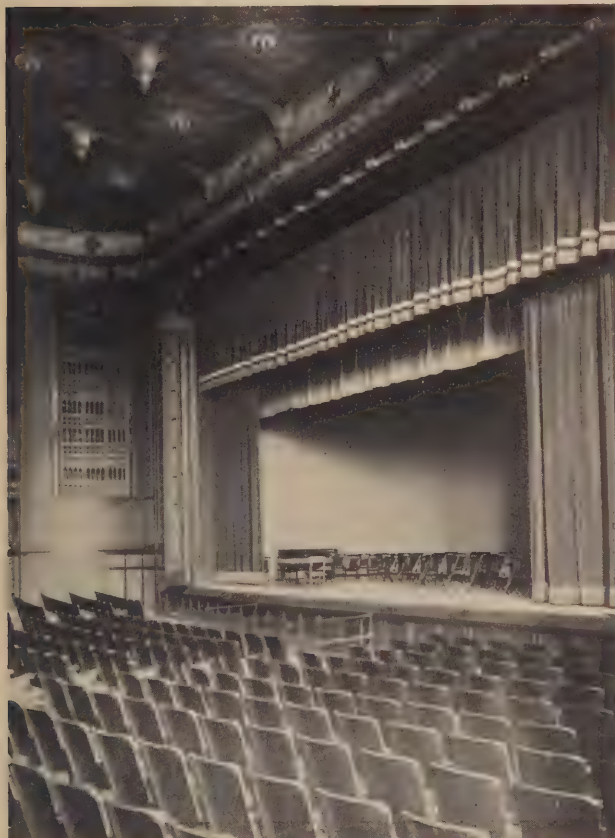


FIRST FLOOR PLAN

EVANSTON TOWNSHIP HIGH SCHOOL, EVANSTON, ILL.
PERKINS, FELLOWS & HAMILTON AND HAMILTON, FELLOWS & WILKINSON, ARCHITECTS



MAIN ELEVATION



Photos. Swain



Plans on Back

AUDITORIUM

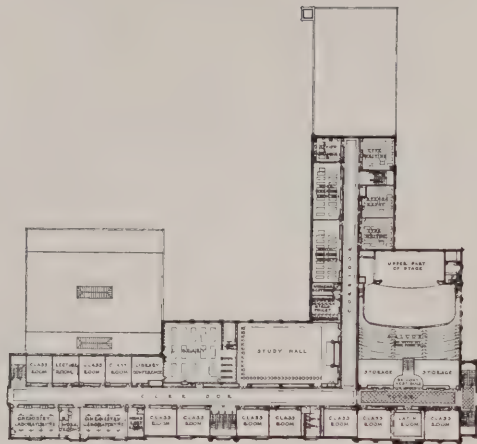
GYMNASIUM ENTRANCE

JACKSON HIGH SCHOOL, JACKSON, MICH.
CHILDS & SMITH, ARCHITECTS

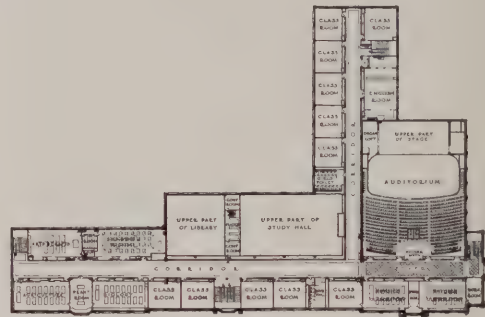
COST AND CONSTRUCTION DATA

Completed September 1927, this school has a capacity of 2,000 pupils and was built at a cost of \$1,130,000 or 33 cents per cubic foot. The cost per pupil is approximately \$565.

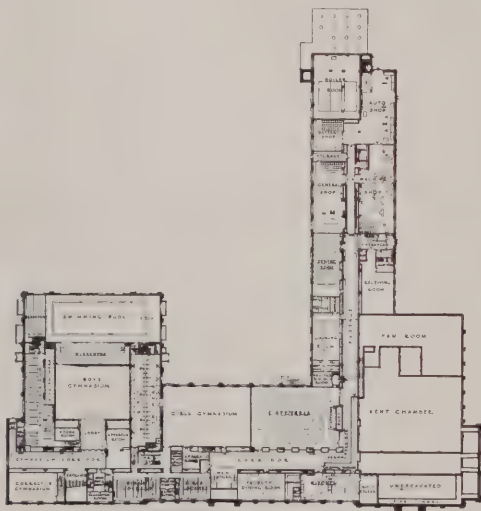
It is fireproof in construction, and the exterior finish is brick with cut stone trim. The roofs are covered with tar and gravel composition.



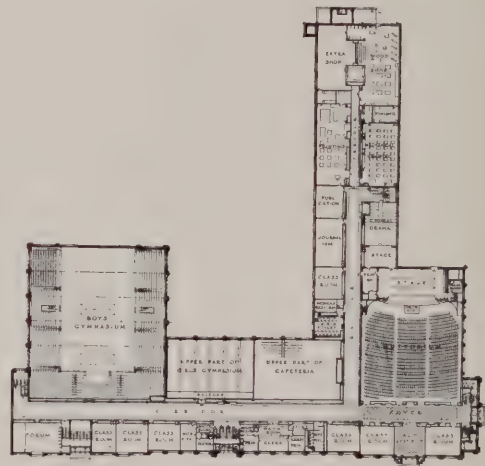
SECOND FLOOR



THIRD FLOOR



BASEMENT



FIRST FLOOR

PLANS, JACKSON HIGH SCHOOL, JACKSON, MICH.
CHILDS & SMITH, ARCHITECTS



GENERAL VIEW



Photos. Gabriel Moulin

END BAY OF AUDITORIUM



MAIN ENTRANCE

Plans on Back

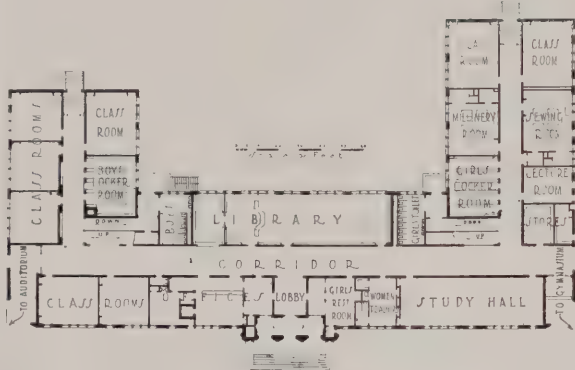
SANTA ROSA HIGH SCHOOL, SANTA ROSA, CAL.

W. H. WEEKS, ARCHITECT

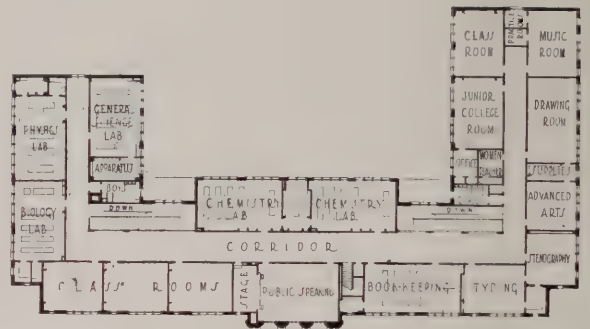
COST AND CONSTRUCTION DATA

Having a capacity of a thousand pupils, this school was completed in 1925 at a cost of \$368,305 or 24 cents per cubic foot, making a unit cost of about \$368 per pupil. The cost of equipment used in this building was \$40,000.

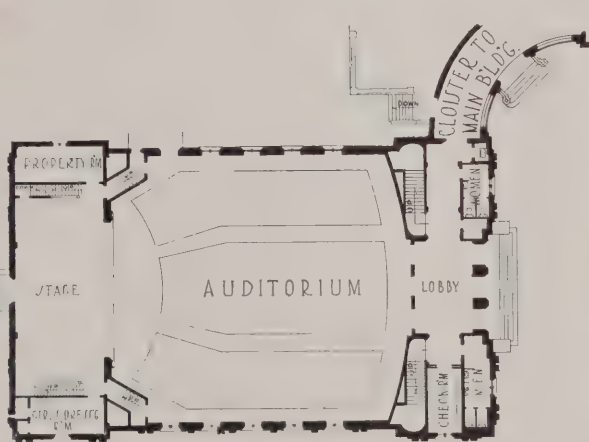
Pressed brick in variegated shades trimmed with cast stone and terra cotta are used for the exterior finish, while the roof covering is of terra cotta tile. The general construction is fireproof.



FIRST FLOOR



SECOND FLOOR



AUDITORIUM WING



GYMNASIUM WING

PLANS, SANTA ROSA HIGH SCHOOL, SANTA ROSA, CAL.

W. H. WEEKS, ARCHITECT



GENERAL VIEW



Photos. John Wallace Gillies

CORRIDOR ENTRANCE



GYMNASIUM ENTRANCE

Plans on Back

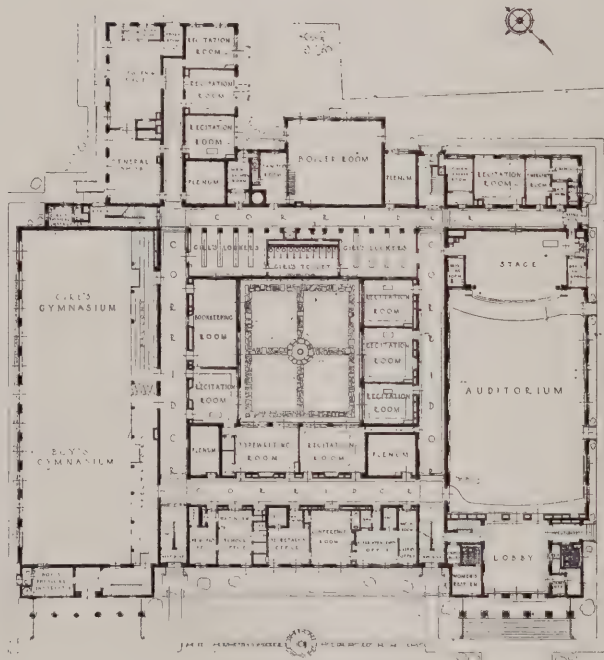
ORANGE HIGH SCHOOL, ORANGE, N. J.
ERNEST SIBLEY AND LAWRENCE C. LICHT, ARCHITECTS

COST AND CONSTRUCTION DATA

The capacity of this school is 965 pupils, and it was completed in 1925 for \$781,000 or 41.4 cents per cubic foot.



SECOND FLOOR



FIRST FLOOR

PLANS, ORANGE HIGH SCHOOL, ORANGE, N. J.
ERNEST SIBLEY AND LAWRENCE C. LICHT, ARCHITECTS



GENERAL VIEW



ENTRANCE DOOR



REAR OF AUDITORIUM

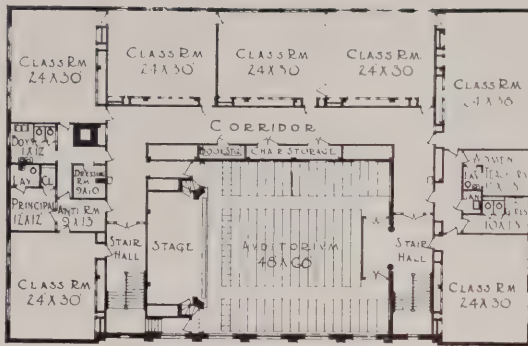
Plans on Back

WESTBORO HIGH SCHOOL, WESTBORO, MASS.
JAMES H. RITCHIE & ASSOCIATES, ARCHITECTS

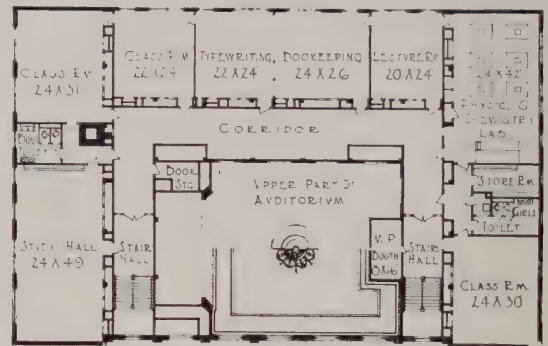
COST AND CONSTRUCTION DATA

Work on this school was completed on May 22, 1926. The total cost was \$264,000 or 39.6 cents per cubic foot. It is designed to accommodate 500 pupils, making the cost per pupil \$528. The equipment cost was \$16,800.

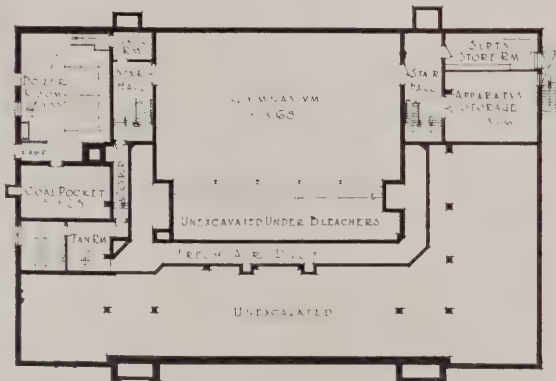
It is built in the Georgian style of light colored brick with limestone trim. The roofs are covered with tar and gravel.



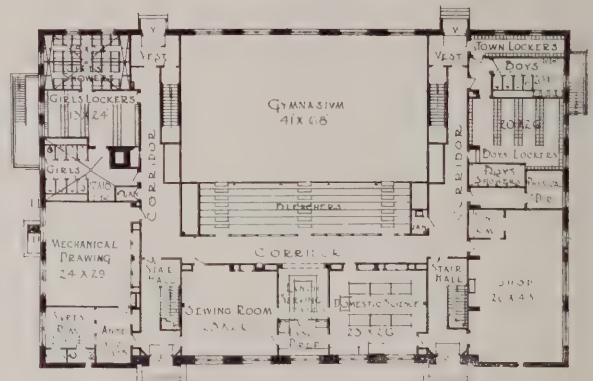
SECOND FLOOR



THIRD FLOOR



BASEMENT



FIRST FLOOR

PLANS, WESTBORO HIGH SCHOOL, WESTBORO, MASS.

JAMES H. RITCHIE & ASSOCIATES, ARCHITECTS



GENERAL VIEW



Photos, Tebbs & Knell, Inc.

END BAY



Plans on Back

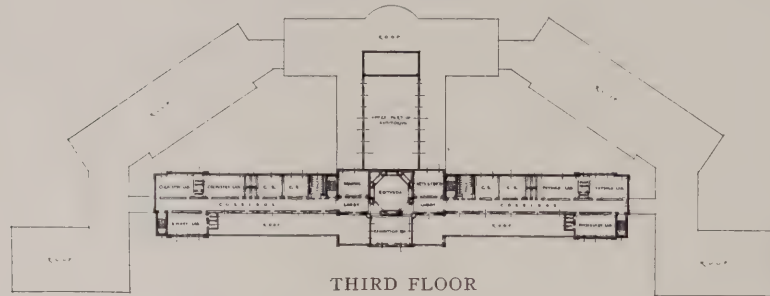
MAIN ENTRANCE

GIRLS' SENIOR HIGH SCHOOL, ATLANTA
EDWARDS & SAYWARD, ARCHITECTS

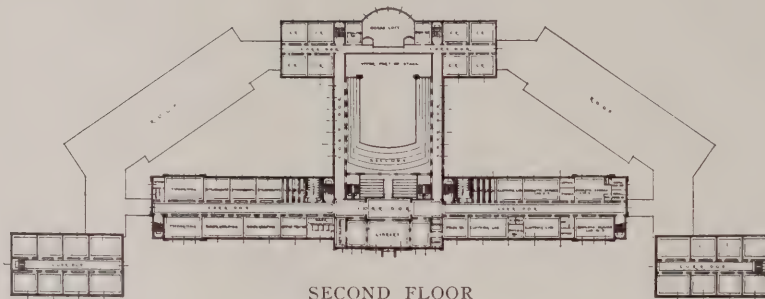
COST AND CONSTRUCTION DATA

The first or central unit of this building was completed in January, 1926 at a total cost of \$500,000 or 40 cents per cubic foot. Its capacity is 1,300 pupils, making the cost per pupil about \$384. Equipment costing approximately \$45,000 has been installed in the building.

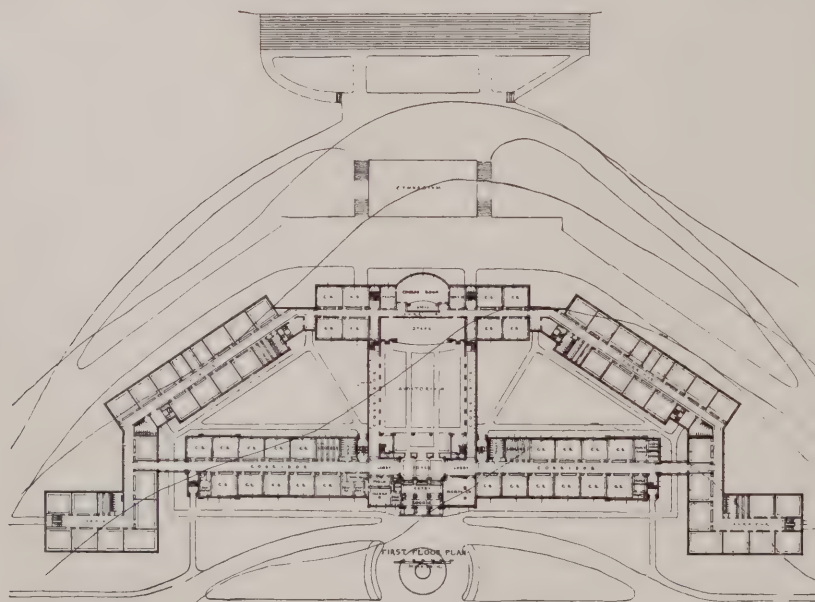
The general construction is fireproof.



THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

PLANS, GIRLS' SENIOR HIGH SCHOOL, ATLANTA
EDWARDS & SAYWARD, ARCHITECTS



GENERAL VIEW



Photos. Dix Duryea

CENTER TOWER



ENTRANCE DETAIL

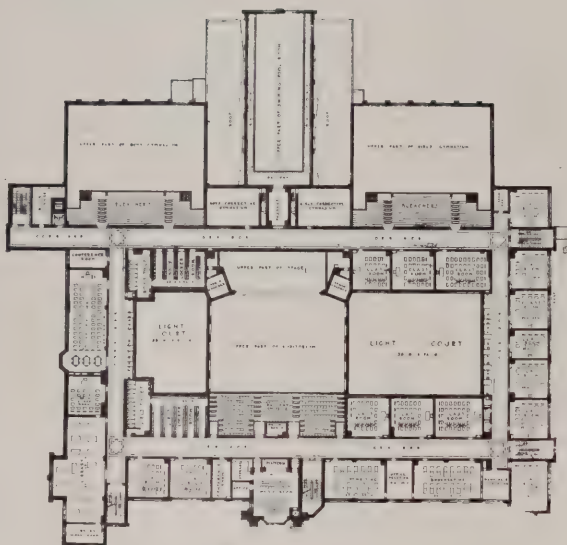
Plans on Back

COLUMBIA HIGH SCHOOL, SOUTH ORANGE, N. J.
GUILBERT & BETELLE, ARCHITECTS

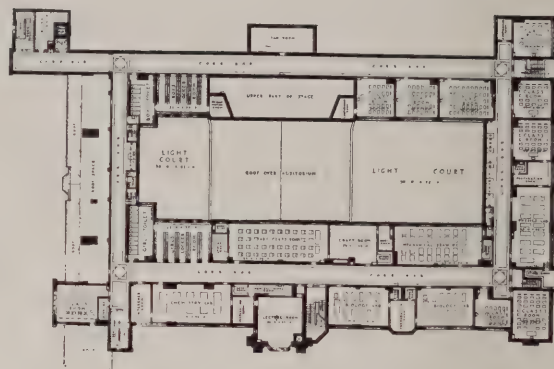
COST AND CONSTRUCTION DATA

Completed in September, 1927 at a total cost of \$1,493,105 or 52 cents per cubic foot, this building has a capacity of 1,630 pupils, making it cost about \$916 per pupil.

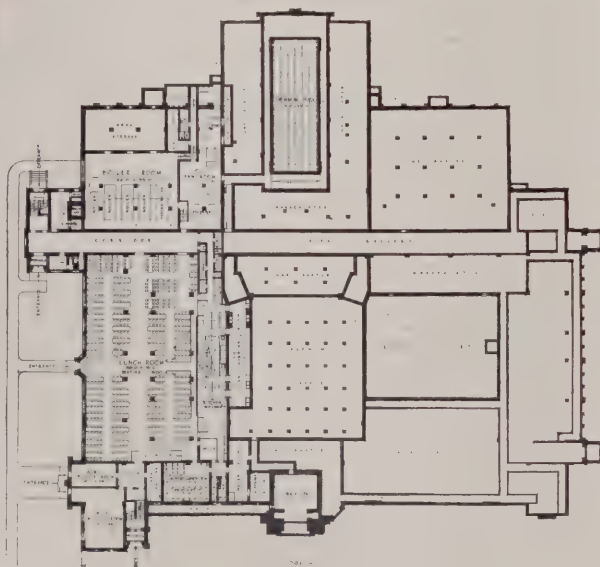
Slate is used for sloping roofs, and pitch and slag composition on the flat roofs. The exterior walls are of brick trimmed with limestone, and the general construction is fireproof.



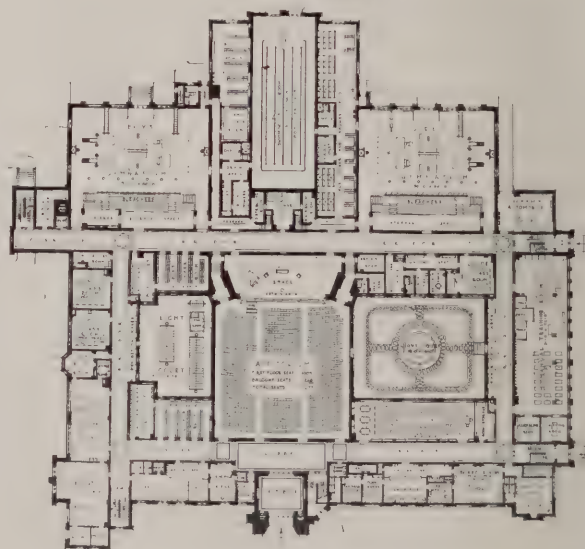
SECOND FLOOR



THIRD FLOOR



BASEMENT



FIRST FLOOR

PLANS, COLUMBIA HIGH SCHOOL, SOUTH ORANGE, N. J.
GUILBERT & BETELLE, ARCHITECTS



GENERAL VIEW



Photos. White

ENTRANCE TO WEST WING



SIDE ENTRANCE

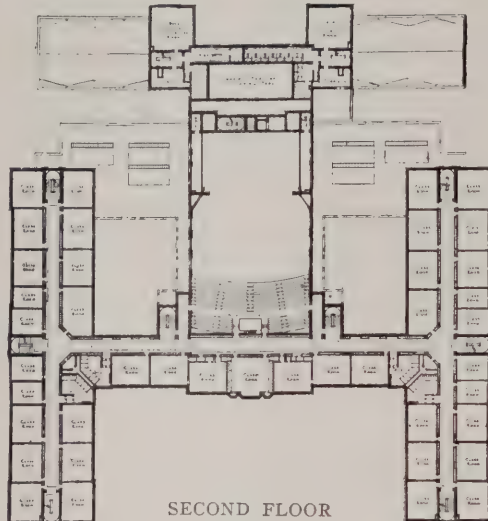
Plans on Back

CLEVELAND HEIGHTS HIGH SCHOOL, CLEVELAND
WARNER, McCORNACK & MITCHELL, ARCHITECTS

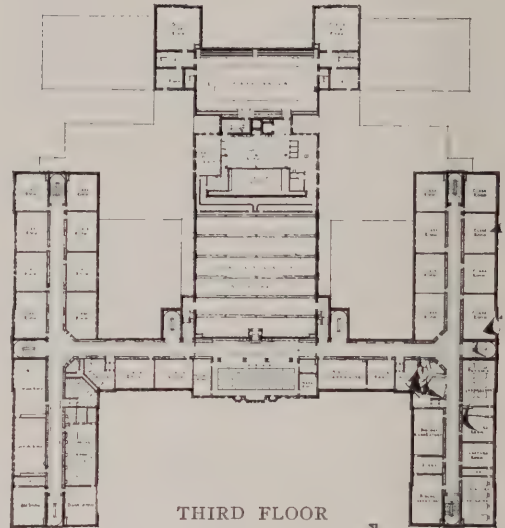
COST AND CONSTRUCTION DATA

Exclusive of the equipment which cost \$82,913, the total cost of this building was \$1,430,685 or 53 cents per cubic foot. It is designed to accommodate 2,100 pupils, which makes a unit cost of about \$681 per pupil.

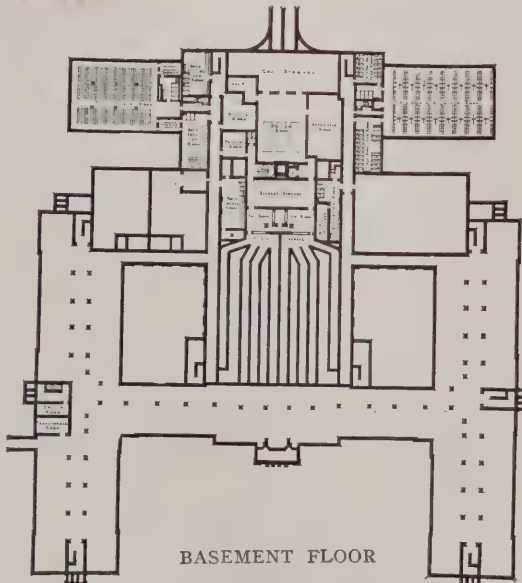
The construction is fireproof, the exterior walls being of brick and stone and the roof covering slate and composition.



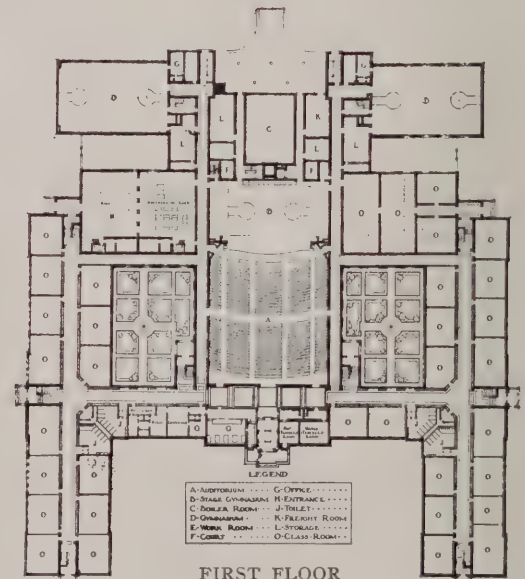
SECOND FLOOR



THIRD FLOOR



BASEMENT FLOOR



FIRST FLOOR

LEGEND
A. AUDITORIUM C. OFFICE
B. STAGE GYMNASIUM H. ENTRANCE
C. BOILER ROOM J. TOILET
D. GYMNASIUM K. TELEPHONE ROOM
E. WORK ROOM L. STORAGE
F. CLOSET O. CLASS ROOM

CLEVELAND HEIGHTS HIGH SCHOOL, CLEVELAND
WARNER, McCORNACK & MITCHELL, ARCHITECTS

THE NEW SCHOOL BUILDING, THE ARCHITECT, AND THE BOARD OF EDUCATION

BY

JAMES O. BETELLE

OF THE FIRM OF GUILBERT & BETELLE, ARCHITECTS

THERE will always be a demand for new school buildings or additions to old schools as long as our country continues to grow and remains a democracy. At the present time there are hundreds of thousands of school children in the United States housed in makeshift buildings, portable schools, rented spaces and dwellings, stores, annexes, attics and basements. There are an equal number or more attending school only part time, and in addition to this, every city has a greater or less number of overcrowded classrooms. From this it can be seen that crowded school conditions exist today, and they probably will always exist for the reason that like all public work, school accommodations are added slowly and are always behind the actual needs. The demand for additional school accommodations manifests itself in a number of different ways. Its first symptoms are overcrowding in classrooms, then the renting of outside accommodations or the erection of temporary portable school buildings on the school grounds. When conditions have reached such a stage as this, there is not much for the local board of education to do to convince the citizens that additional school accommodations are necessary. The crowded conditions and the part-time classes have probably so upset the daily routine of the homes that the demand for more accommodations comes from the citizens rather than from the school board.

An architect is always interested in the erection of a school building or the development of a school building program. He is interested, first as a citizen and taxpayer, and second as an architect, whose business it is, among other things, to design and supervise the erection of school houses. This article will discuss the various phases of an architect's interest in the new school building, from both a business and a personal standpoint.

After the need for additional school accommodations is recognized, the intelligent thing to do is to ascertain the extent of the need and to decide upon a remedy. If merely an addition to an old structure, or the erection of a single new building is necessary, the situation is comparatively simple. It may happen that the community in question has, for one reason or another, neglected its school buildings, or that the community has experienced unusual growth, with the indications that further increased additions of population are in store for it. In the latter case, it would be wise for the architect to recommend that an educational survey be made to determine the best means of providing the additional school accommodations needed immediately, and to provide a comprehensive future building program, extending over a period of years. It might not be amiss to say here that the making of an educational survey is a special line of work, wherein the services of an educational ad-

ministrator are of greater value than any that could be rendered by an architect. While it is true that architects at times attempt to make educational surveys, such surveys have not the value of those made by a trained educator, who has specialized in this type of work. It remains for the educational authorities to outline the problem in the terms of buildings to be erected, their sizes and uses, and then for the architect to work out this problem in like terms. It is no more reasonable for the architect to attempt to do educational work than it is for the educator to do architectural work. Both lines of effort are specialties and are of sufficient scope and importance to be made a life-long study, and it is hardly within the realms of possibility for any one person to know both subjects sufficiently to render creditable service.

In a school building program, the architect should be retained early in the proceedings. If there are not sufficient funds or authority available for retaining the architect to design the buildings contemplated, there should be enough money made available by the board of education to retain an architect for special services and advice until the full appropriation has been obtained. In the case of the selection of school sites, the architect can be very useful. The ideal way to make a selection of a site is for the board of education to place before the superintendent of schools several attractive sites for the building, and ask his opinion as to their advantages from a school administration standpoint, and at the same time to ask the architect's views from a building standpoint. What may appear to be an impossible site on account of grades and topographical peculiarities, may develop into a very advantageous site under a skillful architect. What may appear to be a good building site to the layman, may upon investigation by the architect prove to be unsuitable for some such reason as wet soil, underlying rock, or the limited bearing power of the ground. After the question of site has been put up to both the superintendent of schools and the architect, and they agree on the same site, there can be little ground for argument, but should they differ on the site to be selected, it then becomes the duty of the board of education to weigh the merits of the case and come to a decision which will be for the best interests of the community.

The adoption of a building program covering a period of years by the board of education has many advantages. It permits the selection ahead of time, and for that reason allows the purchase of school sites at reasonable prices, thereby often saving thousands of dollars to the taxpayers. The adoption of a building program permits these sites to be selected at proper locations long before those particular parts of the community have been built up, and when large

tracts of land of sufficient sizes for school purposes can be obtained at relatively low prices. It is to be regretted that many communities wait until everything is built up and more school accommodations needed before purchasing sites for schools. This means that the size of the site is restricted and the small piece of ground obtained is very expensive, due to the surrounding improvements.

An element in regard to the erection of a new school building that is of primary interest to the architect is the point of view of the board of education in making a selection of an architect to do the work, and it is probably of equal interest to the board of education to know the points of view of the architects who are being considered in connection with the work. Every owner naturally wants to secure the finest and largest possible school building for the money available, and every architect who is in touch with the school board naturally feels that he should be selected to do the work. With this situation confronting a school board, it is not an easy task to select an architect, as each candidate for the work has his friends and adherents, and they do not hesitate to press the claims of their favorites upon the individual members of the board of education. The board is a public body, and as such is in duty bound to give courteous and patient attention to the claims of the various architects.

The final selection may be arrived at in one of three ways. First, the board may invite a number of architects to appear on a certain evening at a special meeting and then give each candidate a few minutes to tell his story. This is the most unsatisfactory way of any, because after interviewing a few candidates the members of the school board, who are already tired out from a hard day's work before the evening meeting, are practically exhausted after hearing two or three architects endeavoring to sell their services,—and the half-dozen yet to come get but little consideration. Besides this being an unsatisfactory way for an owner to select an architect, it is undignified and almost humiliating as far as the architects are concerned. To wait in an anteroom with possibly ten or a dozen fellow architects, all scrambling for the same commission, and kicking one's heels together until it is time to be called by the board and given a few minutes to tell his story, is not a very inspiring sight or a dignified position for a capable architect. The selection of an architect made on this basis is sure to end in regrets. The architect is placed in an unfavorable position from the start. He has not the opportunity or sufficient time to tell his story or answer the questions of the board or to discuss their problems with them. He is also placed on a competitive basis very often as to the price of his services, as well as to what he claims he can do for the money available. It then results in the selection of the architect who makes the most extravagant promises and tells them what a large building he can give them for little money, the great amount of services included in his commission, or

for how small a fee he will do the work. The average school building is likely to be a relatively large work in the ordinary architect's office, and inasmuch as the architect is making his living by designing and supervising buildings, he is naturally very desirous of obtaining the commission.

The conservative and reliable architect is not the one usually selected on this basis. He is careful in the statements and promises he makes, and is, therefore, no match for the high powered salesman who agrees with all the demands of the board and describes in flowery language the kind of building he can design for little or no money. If conscientious and upstanding architects would refuse to be parties to such a scramble for work, school boards would soon realize that there are other and better methods whereby an architect can be selected, as the only men responding to their invitation would then be those who were the least desirable to engage. It has been found that reduced architects' commissions or the inclusion of a clerk of works on the site all the time, or payment of traveling expenses, have very little influence with a broad-minded board of education. They are quite willing to pay the usual 6 per cent fee for architectural services of quality, and such concessions tend to lose a good commission for the architect rather than to win it. An architect who agrees to design a building for an absurdly small fee has but little respect for his services,—but then he probably knows what they are worth.

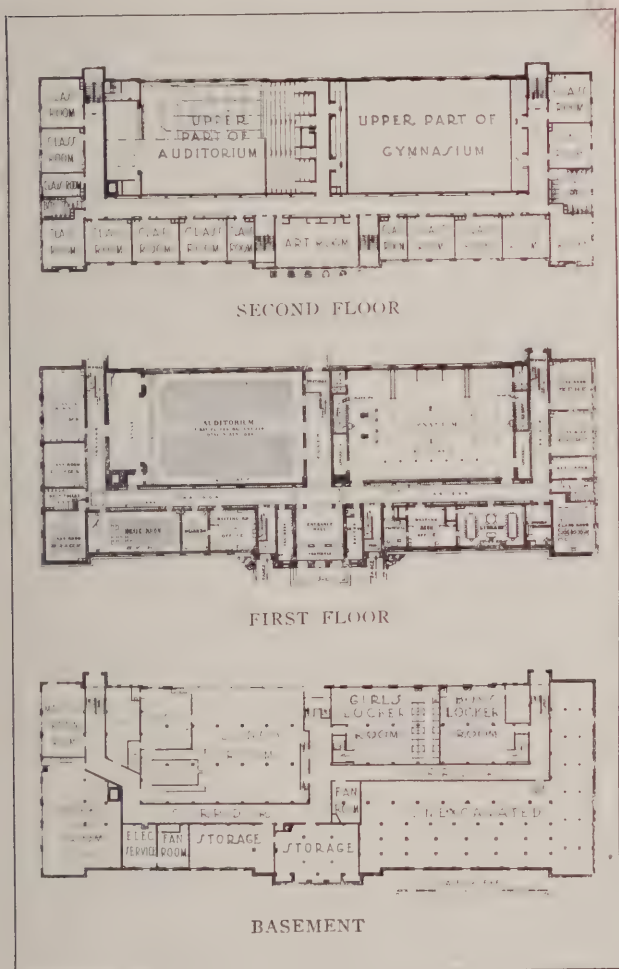
It would seem a fair proposition that if a school board wanted to interview the architect, they should have some process of elimination and select only two or three, and then give each of these an evening to discuss the problem, after which the board can make an intelligent selection. Surely there can be no complaint from the board if the architect agrees to match his time and experience against theirs, with the resultant benefit to both parties. The two or three architects to be given a final interview can be selected and the others eliminated by the issuance of questionnaires, which will set forth the education, office organizations, and past performance of the applicants, together with specimen sets of working drawings and specifications of similar buildings.

The third method of selecting an architect is on the basis of an architectural competition in which drawings are submitted and a judgment made. It is to be regretted that school boards are not more familiar with the fact that the American Institute of Architects has a standard form of competition program which has been prepared for the convenience of committees proposing to hold competitions, that copies of this document can be obtained by simply writing to the headquarters of the American Institute of Architects, 1741 New York Avenue, Washington, or that they can be obtained from the local chapters of the Institute, located in the important cities of the country. The terms of this program are, of course, familiar to all architects, are easily understood by school boards, and are recognized as



Photos. Dix Duryea

FRONT ELEVATION



REAR ELEVATION

The architectural treatment of the stairway towers at either end of the rear elevation is one of the interesting features of the Greenwich High School. Both the auditorium and the gymnasium are located at the back of the building on the first floor level.

GREENWICH HIGH SCHOOL, GREENWICH, CONN.
GUILBERT & BETELLE, ARCHITECTS

fair to both the owner and competitor. It is strongly recommended that school boards, which have in mind architectural competitions for school buildings, obtain copies of this competition circular and program, and they will find that the good results obtained by its use will justify their action.

Assuming that the architect has been selected, he should not only get acquainted with the members of the board of education, but he should get in especially close contact with the superintendent of schools. After all, the superintendent of schools is the executive officer of the owner, and it is to him that the owner looks for guidance, not only in educational matters, but also as to the requirements for the new school building. It will be found that school superintendents are now much better informed with regard to the requirements of an up-to-date school building than they have been in the past. Inasmuch as the school superintendent has a working knowledge of the building requirements and can discuss them intelligently with the architect, it is as little as the architect can do to know the operation of a modern school, to study the educational requirements of the superintendent, and to try to understand his point of view. The best results can be obtained only through this knowledge, mutual understanding, and respect. There are many items of information that the architect will have to know in a preliminary way before starting to make sketches for the new building, such as the kind of school needed, what is to be its capacity, a survey of the site, and other details.

Generally the appropriation has been made before the architect is engaged, but now and then it happens that the appropriation has not been made, and this is a better situation, as far as the architect is concerned, than having a definite sum of money allotted for the new building. As a rule, the appropriation is nothing more than a guess, and the requirements and ideas of the board do not correspond to the amount of money appropriated, as the appropriation is small and the ideas are large. So, if the appropriation is still to be made, the architect is in a good position to start his sketches on proper lines and to advise the board as to the cost of the building after the sketches have been adopted, and the proper amount of money obtained before the bids are received.

It should be realized early in the situation that most states have departments of education, which in turn have sub-divisions which must approve and pass on plans for new public school buildings before they can be erected. It is, therefore, incumbent upon the architect to obtain a copy of the state school building law and the latest regulations of the department having in charge the erection of school buildings. Even if the architect has designed other school buildings in the same state, he is likely to experience regret unless he obtains the latest rules and regulations of the department early in the sketch stage. If he does not, it may be embarrassing later on and possibly mean expensive alterations and changes in the plans. After the sketches are drawn and reach the stage of

meeting the approval of the owners, it is then wise to send prints, or better still take them personally, to the state department of education and go over them with the individual in charge of buildings. This will make sure that the sketches are along lines that will be finally approved when the working drawings are completed. If this procedure were always followed it would save heartaches and much unnecessary expense to architects who have failed to submit their plans in sketch form, but waited until the working drawings were completed and then found that fundamental changes in their layouts were required by a department of education.

With regard to the plans of the building, we hear a great deal these days about standardization. As far as the general plan of the building is concerned, no standardization is possible if the building is to meet the requirements of the particular community in which it is built, and fit the site and be in character with the surroundings. Standardization of detail is possible in large cities or in architects' offices making a specialty of school building design. These standards apply only to such things as stairs, classroom fittings, toilet rooms, equipment of special rooms, etc., but never to the layout or general plan, as this has to be designed to fit the individual needs of the building, the points of the compass, the topography and shape of the lot, and other conditions.

With regard to the proper architectural style to be used in a school building, it is hardly necessary to mention the various elements controlling this, but in spite of fear of repetition, it may not be amiss to mention some of the limiting conditions. In the first place, a school building should look like a school and not like a public library or a city hall. The architectural style adopted should be in keeping with the community; that is to say, if the town is in New England with colonial traditions, a Colonial building would be appropriate. If the building is in a college town adjacent to the college buildings which are of Collegiate Gothic, a building of similar style would be appropriate. If it is in California or the southern part of the United States, a Spanish or Mission style might be appropriate, so that local conditions and good taste should govern the style adopted.

With regard to the materials used in a school, it is hardly necessary to say that these materials should be simple and substantial. Elaborate marbles and bronzes and expensive materials are out of character in a public school building, and the architect must realize that he is not building a state capitol. Elaborate decoration, either inside or outside, not only costs money but is inappropriate. A school building has sometimes been called an educational factory or workshop, and it is on that basis that it should be designed. Cheap imitations and substitutes for more elaborate and expensive materials should also be avoided. These imitations and substitutes have not the wearing qualities of the imitated material, and it is much better to get a simple and substantial building than an elaborate structure built of substitutes.

A school building, while not occupied many hours in the day, is nevertheless subjected to excessive wear. When it is realized that the building houses thousands of pupils and that they change classes every 45 minutes or thereabouts, it can be seen that tremendous wear is received and that only the most substantial materials will stand up under it. A simple, straightforward, businesslike building is looked upon with favor by the taxpayer, who has no objection to paying for the essentials, but who finds fault with what he considers undue elaboration and expense in connection with school buildings.

In connection with the materials to be employed, a word about the use of new materials and appliances might also be in order. The careful architect will go slowly in specifying any new material or appliance for use in a school building. In private work the architect may be a pioneer and, with the consent of his client, try out and adopt any new apparatus or material that strikes his and the owner's fancy, and which his judgment dictates as appropriate. In a school building the situation is different; this is a public structure and every taxpayer is a part owner. If new materials or appliances are adopted and turn out failures, every citizen and newspaper has a right to criticize; whereas if they turn out satisfactorily, no particular credit is given the architect for taking the chance. This is quite different in a privately owned building, as whether it turns out satisfactorily or otherwise is the concern of no one but the architect and his client. High powered salesmen are continually importuning the school architect to adopt new materials and methods and new appliances, and if an architect succumbs to their high powered methods, he may sooner or later find himself in an embarrassing position. It is a good principle to insist that any material or appliance entering into a public building have a background of a number of years of successful use and a number of satisfied users. "Safety first" is a good motto.

In connection with the layout of the plan, it may be found that the demand for space and capacity is more than it is possible to meet and keep within the sum which it is possible to have appropriated. This is where the skill, experience and knowledge of the educational demands, on the part of the architect, are very valuable. It has been previously said that the architect should know something of educational requirements and routine, and he is then in a position to show how economy in space can be carried out and educational demands still met. There are many different types of economy, such as economy in materials, economy in layout, and economy in use,—that is, the school building used to capacity without unnecessary and idle rooms and spaces. Each of these types of economy must be used with discretion and judgment; otherwise they become false economies, which constitute a form of extravagance. Another type of economy, and after all economy must be practical if we are to meet the tremendous demands for new school buildings, is the economy

brought about by the duplicate use of rooms and spaces. This duplicate use is where a single room is used at different times for one or more purposes, such as a combination gymnasium and auditorium; the use of the lunch room for school purposes except during the middle of the day; a combination sewing and cooking room; or a combination physical and chemical laboratory. These duplicate uses are not as satisfactory as having separate rooms for each and every purpose, but in a small school where the scholars are not of sufficient number to use the special rooms 100 per cent of the time, such economy is necessary, as spaces which are vacant the greater part of the time cannot be justified.

A school building was never known to be large enough to be adequate for more than a few years, so that it should be made flexible in order that future additions can be readily made; in fact these future additions should be planned and thought of from the start, and indicated on the preliminary sketches. It should also be flexible in that partitions can be moved and altered without affecting the structural features of the building, as this may be necessary as time goes on, inasmuch as educational methods change.

To get full value out of a school building it should be planned so it can be used by the citizens for community purposes. It is not only the auditorium and gymnasium that can be so used, although these are the first thought of. The kindergarten can be used for small social gatherings, dances or meetings of the Parent-Teachers' Association. One of the classrooms which has movable furniture can be used for a men's debating club, and in combination with all these purposes the lunch room is always useful. There are other community uses for our schools that do not interfere with their primary purpose, and if we want the community to stand back of the schools, we should encourage their use to the fullest extent.

It is often asked what is the proper number of stories in height for a school building, from the standpoint of desirability and cost. For the purposes of this article, school buildings over three stories high can be ignored, as they are only suitable in large cities, such as New York or Philadelphia, where ground area is not available, and where necessarily the building must be high in order to get capacity. Like all other decisions, the proper thing to do can be determined only by knowing all limiting conditions. Generally speaking, a two-story building is desirable where sufficient land is available; this means only one flight of stairs to climb, and it makes a very safe type of school in case of trouble. A two-story school is in better scale with the surrounding houses than a three-story building. A three-story structure is better for a high school, where the pupils are older, than it is for a grade school. A one-story school has its uses and also its limitations; while large one-story schools have been built, they spread over such large areas as to become unwieldy, and a two-story building in such cases is much better. It would seem that a maximum

size for a one-story building, especially where an auditorium and gymnasium is to be included, would be not more than 10 to 14 classrooms. As to which type of building is cheaper, the single-story or multiple-story, there are figures available to prove either way you want it. The decision as to the number of stories in a school building should not be based on cost. The differences in cost between the different types of same size and capacity are not sufficient to be the deciding factors. The deciding factor should be what is wanted or what is thought to be proper under the particular circumstances of the case.

It is realized that school building costs are always of interest, but they are very difficult to state accurately or in such a way that they would be very useful. These school building costs vary from year to year, due to labor and material market conditions, and in various parts of the country due to local labor and material costs. Prices in the New York metropolitan district do not apply elsewhere, and the architect will have to depend upon his own knowledge of local conditions and building costs to approximate the cost of the proposed building. It has at times been suggested that approximate estimates be obtained from contractors on sketch plans and memoranda specifications. This sounds like a good method, inasmuch as the contractor who deals with costs all the time is in a better position to make a price than the architect could be. In practice, however, this does not work out. No contractor is going to take the time and trouble to take off quantities or carefully go into the cost of a proposed school building, for the reason that he is too busy figuring on actual work and constructing the buildings he has contracts for. Out of courtesy to the architect he makes up some sort of a price, and he sometimes asks what the architect wants it to cost, and, trying to be accommodating, he puts it in at that figure, so that in the last analysis preliminary figures from contractors on sketch plans are useless, especially as there is no responsibility attached to the contractor and no commission to be given out at that particular time; all of which is not very encouraging to accuracy. The architect must, therefore, make up his own figure as to the cost of the building, based upon his knowledge of costs and experience in buildings of similar kinds,—and stand or fall by the result.

There are several methods of stating the cost of a school building, and one of the oldest methods and one still in the minds of school boards and school superintendents, is the "cost per classroom." Years ago, when a school building was simply a box-like structure divided into so many equal parts, each of which was a classroom, it was very easy to determine the cost of the building per classroom. Today, with all the various activities in our schools, especially high schools, it means there are rooms of varying sizes, such as laboratories, shops, libraries, etc., all of larger size than the standard classroom, and in addition, lunch rooms, auditoriums, gymnasiums, and similar large spaces; so it is obvious that the cost per

classroom is not now the basis on which to state the cost of a school building. Another method is to find the cost of a school building "per scholar." This is more definite than the classroom basis, but still somewhat indefinite, due to different methods of computing the scholar capacity of the building. The American Institute of Architects and the National Education Association have fixed upon a method of computing the number of scholars accommodated in a school building, and it might be useful to describe this method here: "Compute the number of pupils normally accommodated in rooms designed for classes only. Special rooms are to be figured at the actual number of pupils accommodated for one class period only. Auditoriums and assembly rooms are to be ignored, but gymnasiums may be figured for one or two classes, as the accommodations may provide. No gymnasiums, however, shall be accredited with two classes, if below 40 by 70 feet in size."

The most accurate way and the most familiar way of stating the cost of school buildings is the same way architects state the cost of any other building, and that is the cost per cubic foot. All architects know how to compute the cubage of their buildings, and they are based on more or less the same methods. Since it is felt that a cubic foot method is the most suitable, it might not be amiss to give some figures as to cubic foot costs, even if they do not apply to all parts of the country or at all times. The average fireproof school building, outside of New York, costs from 45 cents to 50 cents per cubic foot. As we get farther away from New York the labor costs are less and there is a corresponding reduction in prices. A building of semi-fireproof construction can be built for from 35 to 40 cents per cubic foot in the eastern section of the United States.

Another item of interest is the number of cubic feet per scholar in a school building. This varies in different types of schools, averaging around 800 to 1,000 cubic feet per scholar in a grade school; 1000 to 1200 cubic feet per scholar in a junior high school, and 1200 to 1500 cubic feet per scholar in a senior high school. If an architect were asked the cost of a 600-pupil high school, he would not be very far wrong if he figured out in his mind, 600 scholars times 1500 cubic feet per scholar, or 900,000 cubic feet; which multiplied by the cost per cubic foot that the architect determines is the price in his particular district, gives a quick and close approximation of the probable cost of the building. The basis of cubic foot per scholar is on the usual school building without any extraordinary facilities in it, being simply the average. If facilities out of the ordinary are added or omitted, the number of cubic feet per scholar should be adjusted accordingly.

Another question coming up in the minds of boards of education is the time required to get the plans drawn and the school building completed after the appropriation has been made. This is something that is again indefinite, but the board's question has to be answered, at least approximately. The

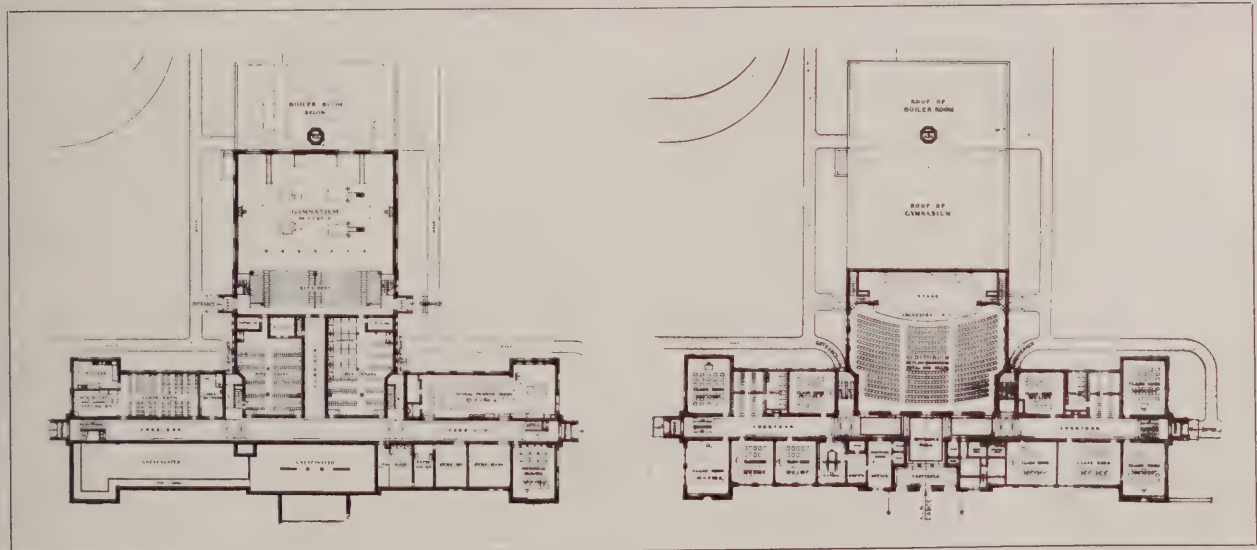


Photos. Drix Duryea

FRONT ELEVATION



REAR VIEW



BASEMENT

FIRST FLOOR

WASHINGTON IRVING HIGH SCHOOL, TARRYTOWN, N. Y.

GUILBERT & BETELLE, ARCHITECTS

part of the work that is going to take up considerable time and cannot be always counted upon is the time given by the board of education to considering the preliminary sketches and deciding upon a definite scheme, which can be adopted and the architect ordered ahead with the working drawings. At the very quickest it takes one or two months to get the preliminary plans adopted by the board, and during that time a number of schemes have been submitted and discussed. After the preliminary plans have been adopted it takes the architect 10 or 12 weeks to make the working drawings, depending more or less upon the size of the building. After this it takes three or four weeks for the contractors to submit their figures, and probably 12 months for the contractor to complete the structure ready for occupancy. Altogether, this means at least 18 months from the time the money is appropriated to the time the building can be ready for occupancy. It can be done in less time, but it generally takes longer than this.

The contractors very seldom finish within the time stipulated in the contract for completion, and one reason for this is the type of contractors who are usually successful bidders on public work, such as schools. It should be realized that price is the only thing that is considered in awarding a contract on public work, for the reason that the law usually prescribes that the contract shall go to the lowest responsible bidder. It is very difficult to prove a contractor is not responsible, especially when he can

get a surety bond guaranteeing completion of the work. Contractors of ability and with large organizations will not figure on school work, because they cannot compete in price with the newly organized and inexperienced concerns and the contractor without organization. But as one usually gets what is paid for, the board gets a slow, and possibly unsatisfactory, building from the lowest bidder, whom they would probably not permit to bid on any of their private work,—and the more responsible and efficient builders are eliminated from the situation.

The architect and the superintendent of schools should get together even during the preliminary plan period and decide upon the size and equipment of the special classrooms, such as laboratories, shops, cooking rooms, etc., which are usually built too small to contain the special furniture and equipment needed for their proper use. Each of these special rooms should have the equipment and furniture laid out to scale as the plans are developed, and the architect can with profit get in touch with one of the many equipment concerns, so that when the building is completed these special rooms can be properly furnished. This layout is also necessary in order that the various electric, plumbing, heating and water outlets can be properly located.

The modern American school has shown vast improvements in plan layouts and architectural expression in the past decade, due to continued coöperation between the architect and school authorities.



Photo. Dix Duryea

End Elevation, Jefferson School, South Orange, N. J.

Guilbert & Betelle, Architects



GENERAL VIEW



Plans on Back

Photos. Paul J. Weber

SIDE AND AUDITORIUM ENTRANCES

SOUTHEAST WING

NORTH PARK JUNIOR HIGH SCHOOL, FALL RIVER, MASS.

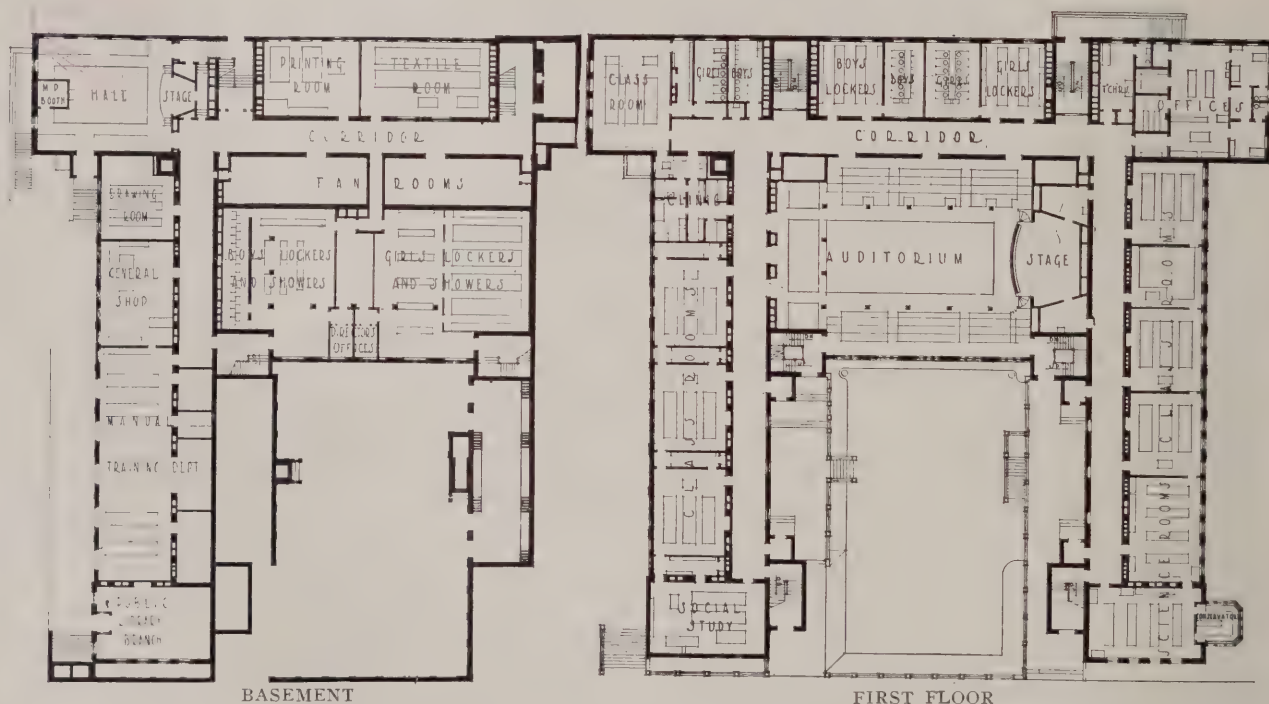
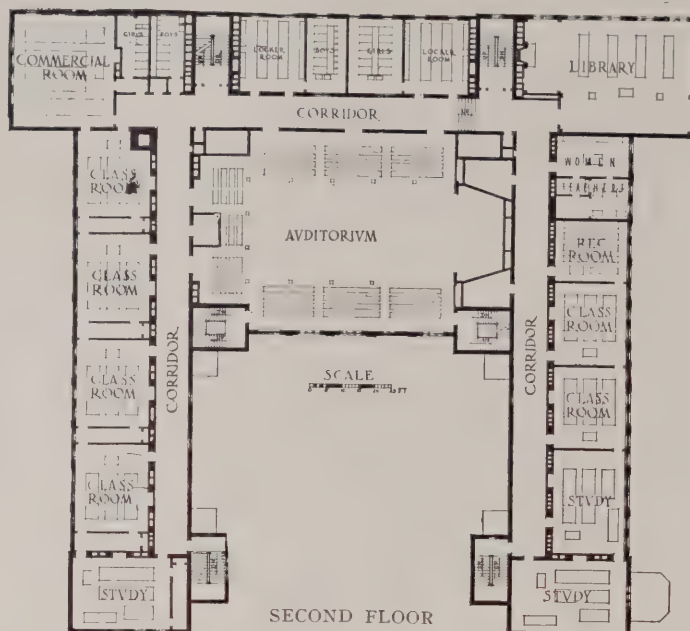
NATHANIEL S. CHASE, ARCHITECT; R. CLIPSTON STURGIS, ASSOCIATE ARCHITECT

COST AND CONSTRUCTION DATA

This school was completed in 1924 at a total cost of \$685,000, or 53 cents per cubic foot. It is designed to accommodate 1200 pupils, which makes the cost

per pupil about \$570. Equipment costing \$59,000 has been installed in the building.

The construction is fireproof with wood roof structure. The exterior walls are of brick; the roof is covered with slate.



PLANS, NORTH PARK JUNIOR HIGH SCHOOL, FALL RIVER, MASS.
NATHANIEL S. CHASE, ARCHITECT; R. CLIPSTON STURGIS, ASSOCIATE ARCHITECT



GENERAL VIEW



Photos. Richard Southall Grant

ENTRANCE TO GIRLS' LOCKER ROOM



* AUDITORIUM ENTRANCE

Plans on Back

JUNIOR HIGH SCHOOL, GLENS FALLS, N. Y.

TOOKER & MARSH, ARCHITECTS

COST AND CONSTRUCTION DATA

Designed to accommodate 630 pupils, this school was completed in 1924 at a total cost of \$360,000, or 33 cents per cubic foot, making the cost per pupil \$571.

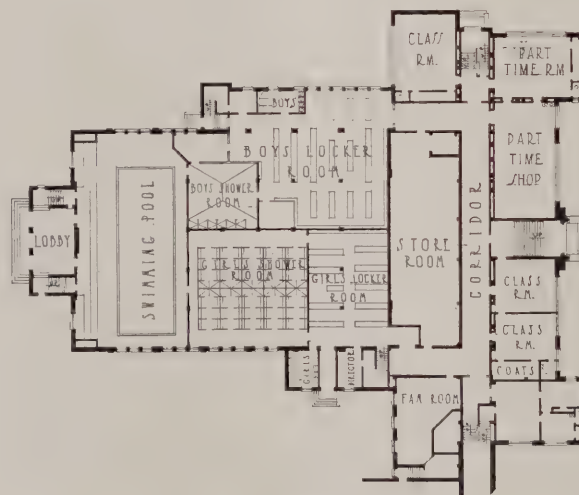
The general construction is fireproof, the exterior walls being of brick trimmed with tile. The roofing material is asbestos.



SECOND FLOOR



FIRST FLOOR



BASEMENT

PLANS, JUNIOR HIGH SCHOOL, GLENS FALLS, N. Y.
TOOKER & MARSH, ARCHITECTS



GENERAL VIEW



Photos. Paul J. Weber

GALLERY IN AUDITORIUM



ENTRANCE PORTICO

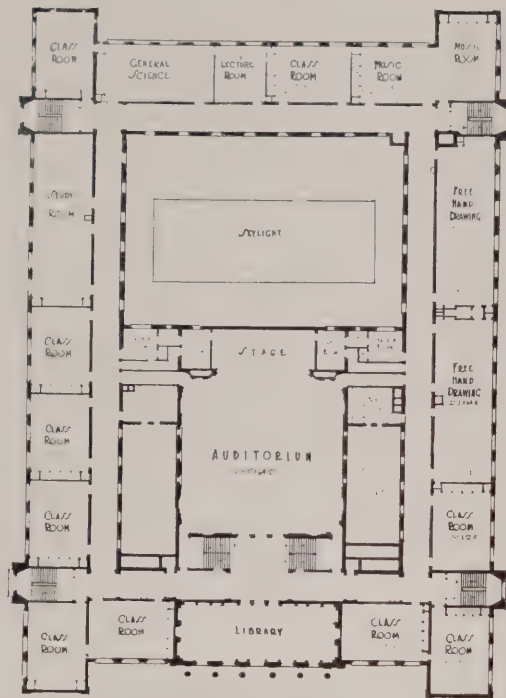
Plans on Back

JUNIOR HIGH SCHOOL, WORCESTER, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS

COST AND CONSTRUCTION DATA

Erected in 1922 and 1923, this building has a capacity of 1762 pupils and cost \$935,000, not including ground and equipment, making the cubic foot cost 40.7 cents. The cost per pupil is \$530.

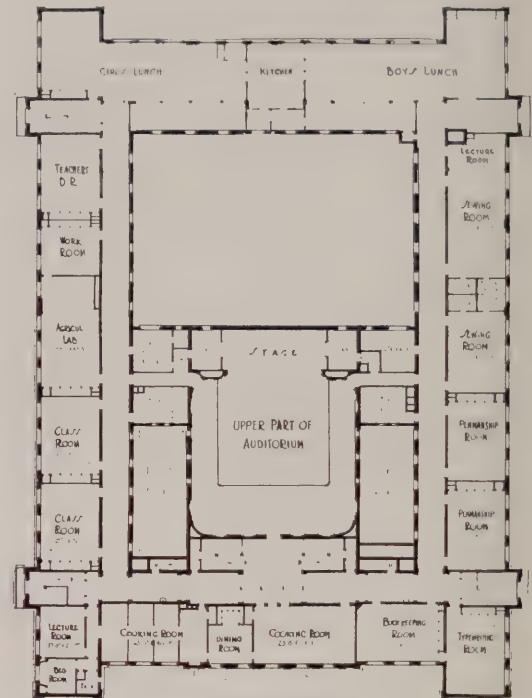
The building has a flat roof and the exterior finish is of sand-struck brick trimmed with artificial limestone. The stairs, corridors, and auditorium are of fireproof construction.



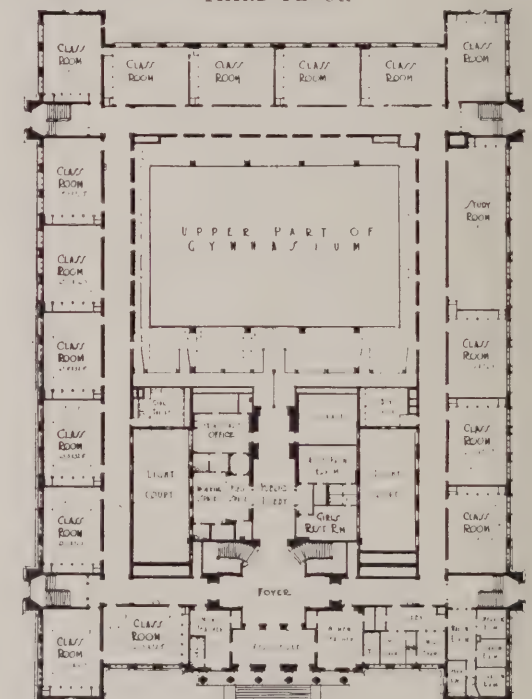
SECOND FLOOR



BASEMENT



THIRD FLOOR



FIRST FLOOR

PLANS, JUNIOR HIGH SCHOOL, WORCESTER, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS



GENERAL VIEW



Photos. Paul J. Weber

SCHOOL ENTRANCE



Plans on Back

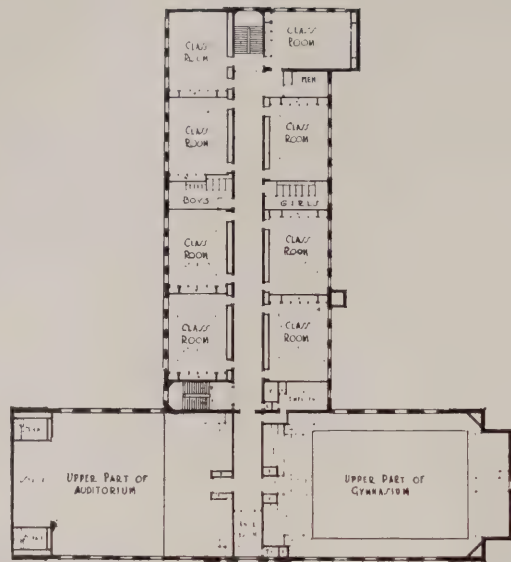
MAIN ENTRANCE

JUNIOR HIGH SCHOOL, FITCHBURG, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS

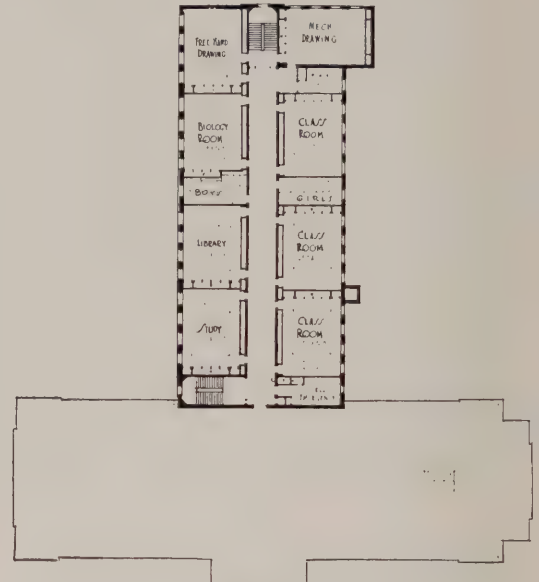
COST AND CONSTRUCTION DATA

Exclusive of ground and equipment, the total cost of this building was \$394,135, or 32 cents per cubic foot. It is designed for 915 pupils, making the cost per pupil \$430.

The corridors and stairways are fire-proof in construction, and the exterior walls are of red waterstruck brick with limestone trim.



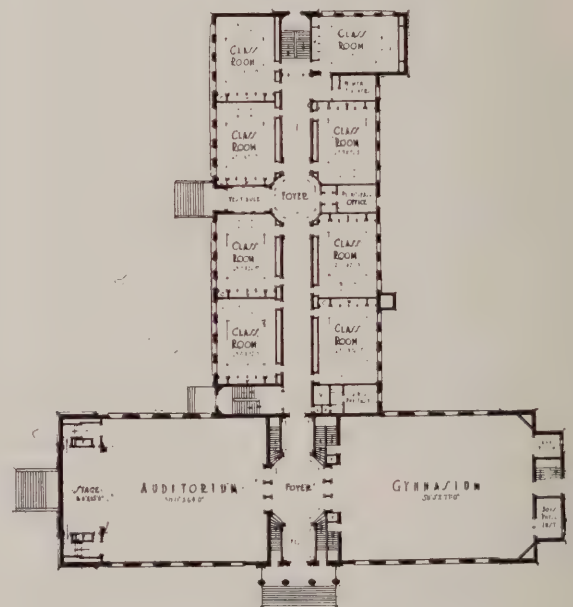
SECOND FLOOR



THIRD FLOOR



BASEMENT



FIRST FLOOR

PLANS, JUNIOR HIGH SCHOOL, FITCHBURG, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS



GENERAL VIEW FROM THE SOUTHEAST



MAIN EAST ENTRANCE

SOUTH ENTRANCE

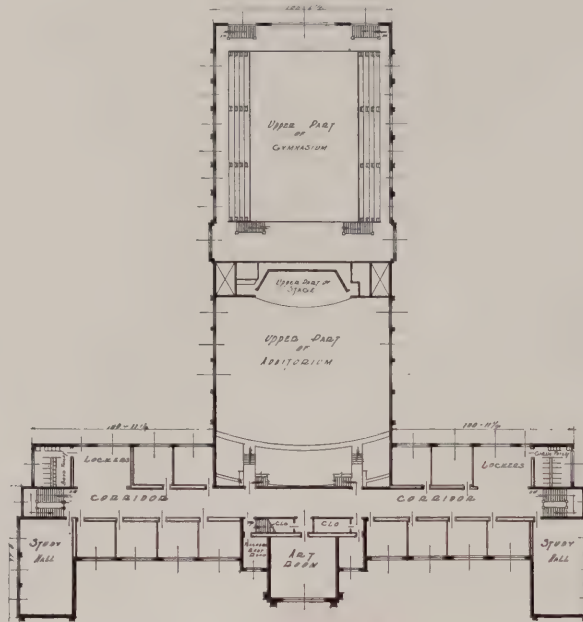
Plans on Back

WOODROW WILSON JUNIOR HIGH SCHOOL, TERRE HAUTE
JOHNSON, MILLER, MILLER & YEAGER, ARCHITECTS

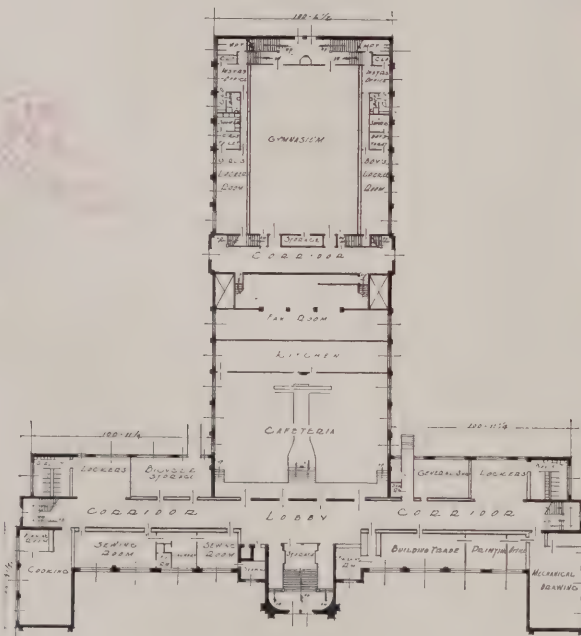
COST AND CONSTRUCTION DATA

Approximately 1800 pupils can be accommodated in this building, which was completed in June, 1927, at a total cost of \$687,425, or 24.6 cents per cubic foot.

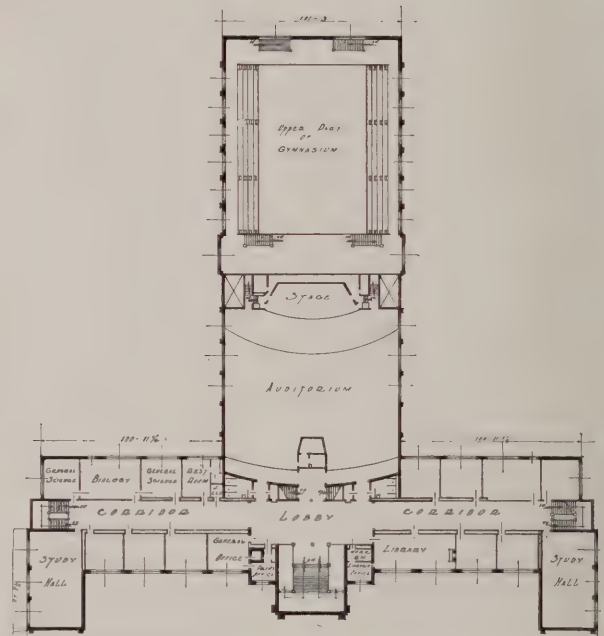
The value of the equipment is \$35,000. Reinforced concrete construction, brick exterior finish and composition and tile roofing make it fireproof throughout.



SECOND FLOOR



BASEMENT



FIRST FLOOR

PLANS, WOODROW WILSON JUNIOR HIGH SCHOOL, TERRE HAUTE
JOHNSON, MILLER, MILLER & YEAGER, ARCHITECTS



GENERAL VIEW



Photos. Theo. M. Fisher

MAIN ENTRANCE



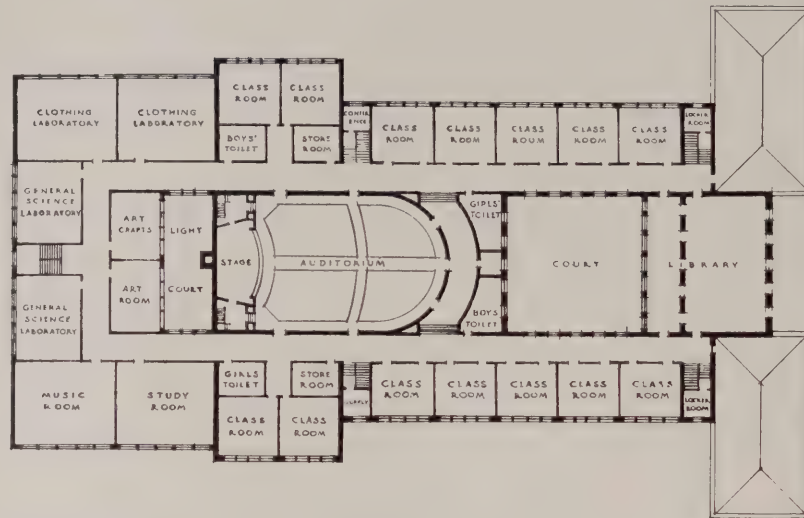
ENTRANCE TO CLASSROOMS

Plans on Back

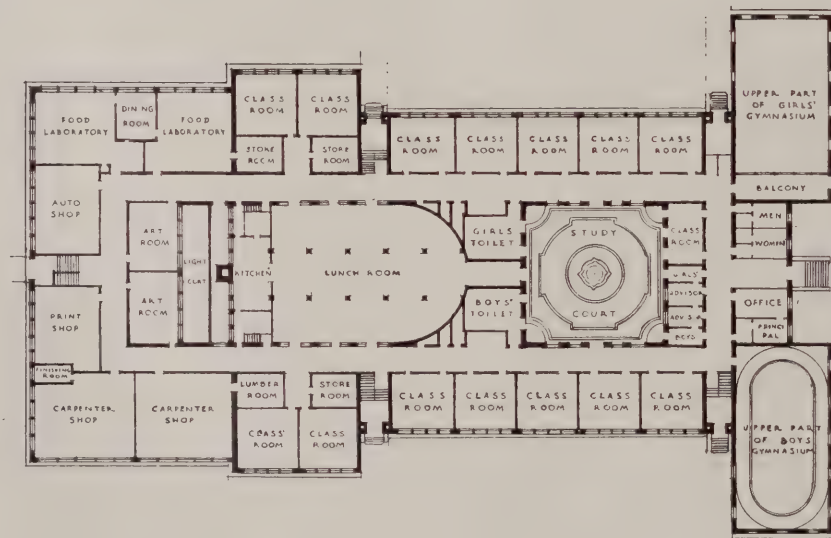
MOREY JUNIOR HIGH SCHOOL, DENVER
WILLIAM E. AND ARTHUR A. FISHER, ARCHITECTS

COST AND CONSTRUCTION DATA

Constructed of reinforced concrete with tile roof, this building was completed in 1926 at a cost of \$775,000, or 40 cents per cubic foot. It has a capacity of 1600 pupils, making the cost per pupil approximately \$484. The equipment used in this building cost \$40,000.



SECOND FLOOR



FIRST FLOOR

PLANS, MOREY JUNIOR HIGH SCHOOL, DENVER
WILLIAM E. AND ARTHUR A. FISHER, ARCHITECTS



PART OF MAIN FACADE



AUDITORIUM ENTRANCE



MAIN ENTRANCE

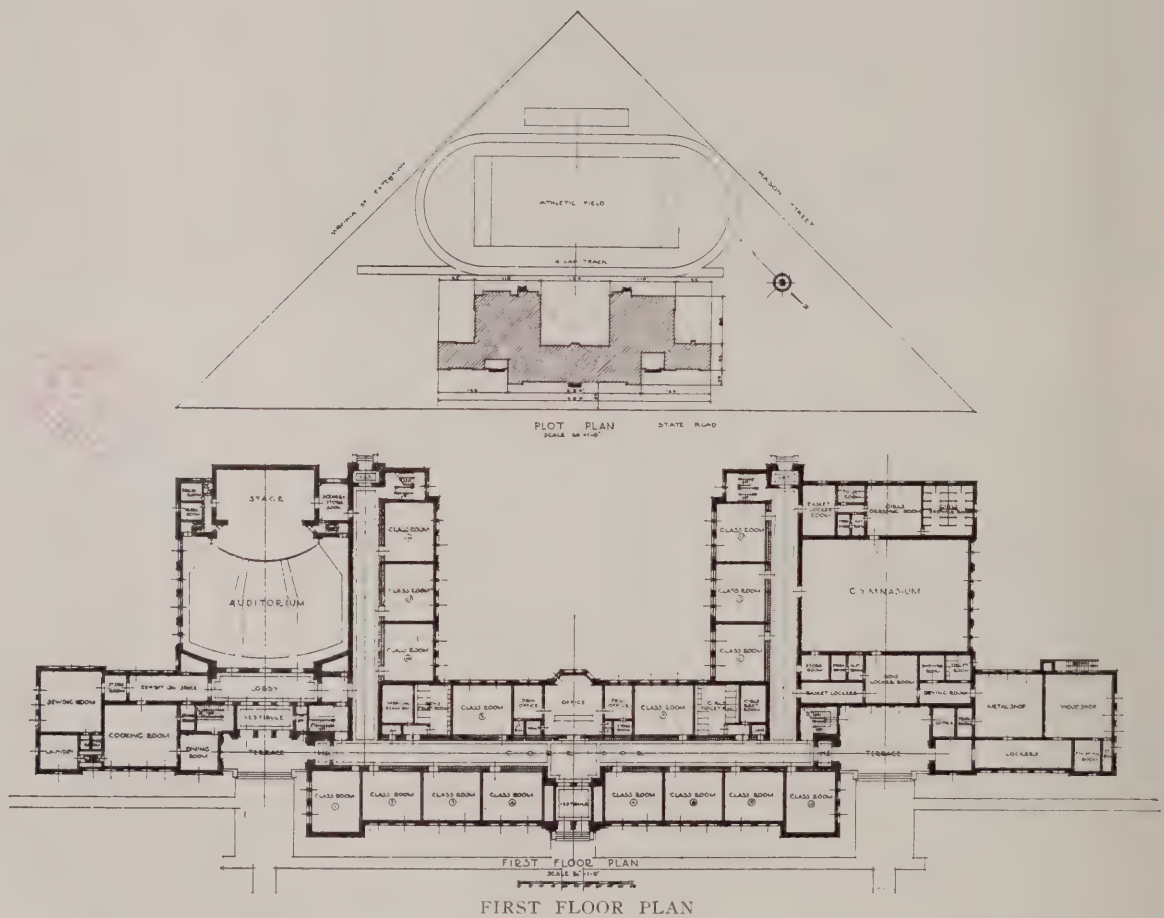
Plan on Back

WILSON JUNIOR HIGH SCHOOL, APPLETON, WIS.
PERKINS, FELLOWS & HAMILTON, ARCHITECTS

COST AND CONSTRUCTION DATA

Sections of this school, designed to accommodate 600 pupils, were completed in September, 1924, at a cost of \$294,904, or 29.6 cents per cubic foot. The cost per pupil was about \$491.50.

Tile and composition roofs were used in connection with brick exterior walls. The general construction is fireproof.



WILSON JUNIOR HIGH SCHOOL, APPLETON, WIS.
PERKINS, FELLOWS & HAMILTON, ARCHITECTS



GENERAL VIEW



PRINCIPAL FACADE



MAIN ENTRANCE

Plans on Back

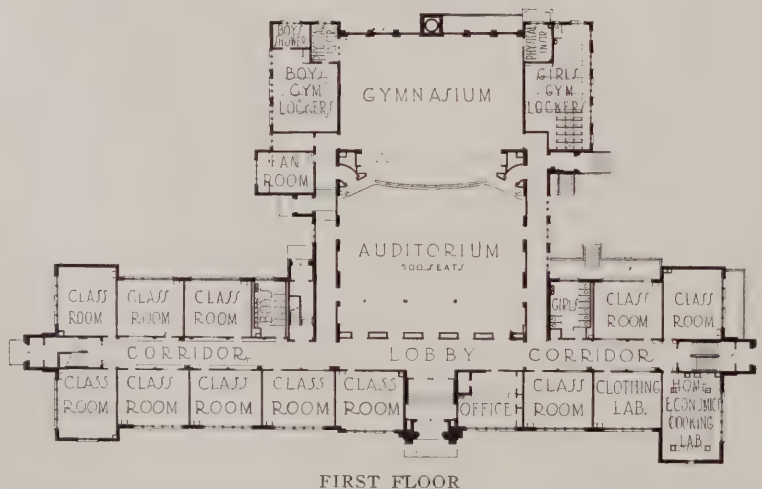
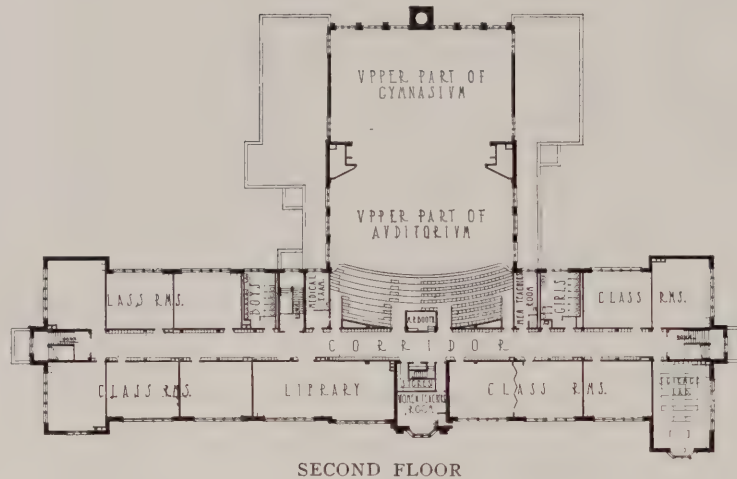
THADDEUS STEVENS JUNIOR HIGH SCHOOL, WILLIAMSPORT, PA.

GUILBERT & BETELLE, ARCHITECTS

COST AND CONSTRUCTION DATA

Completed in August, 1927, this school cost \$409,127, or 40.75 cents per cubic foot. The capacity is 983 pupils, making the cost per pupil about \$406.

The construction is fireproof with brick and limestone exterior finish, and the flat roof is covered with a pitch and slag composition.



PLANS, THADDEUS STEVENS JUNIOR HIGH SCHOOL, WILLIAMSPORT, PA.
GUILBERT & BETELLE, ARCHITECTS

SOME NOTES ON JUNIOR HIGH SCHOOLS

BY

R. CLIPSTON STURGIS, ARCHITECT

THE public knows that schools, both the buildings and the instruction, are costing more and more. Increases in teachers' salaries can be understood and accepted; the cost of the buildings cannot. The blame has been put on the architect and his demand for at least some expression of beauty. This article is to ask for more beauty and less cost in our schools, and to show that wasteful expenditure is in the plan, in the demands of popular pressure for needless rooms and equipment, and not in bricks and mortar, nor in decoration. As a matter of fact, in a school building, the amount that can reasonably be put into ornament either inside or out is a perfectly insignificant item in the total cost. This is a plea for more beauty in our schools.

To understand the problem of the junior high school, it is perhaps well to review the steps which led to the demand for this type of school. Before 1900 the generally accepted division of the 12 grades was eight elementary and four high. The elementary was usually divided into four lower elementary or primary and four upper elementary or grammar. In most eastern cities there was a principal in the grammar school, and he was the head of the primary schools in his district. In response to a general demand for some kind of industrial education in the elementary schools, classes were established in cooking and woodworking for the two upper grades. In the grammar school also was the hall, which was frequently put under the high roof, the most dangerous place in the building for a crowd.

Educators generally were interested in an experiment started at Gary, Indiana. The ideas there embodied were not altogether new, but they emphasized what many were thinking about,—the growing cost of schools; and this was one solution. It came naturally in a manufacturing town, and was the appli-

cation to the schools of a commonplace of manufacturing,—that a plant should be run to its capacity in working hours, and that, as far as possible, all machines should be running all the time. The school was a costly plant. It was idle during vacations. That perhaps could not be helped; but parts of the school were idle part of every school session. The hall was generally unoccupied. The industrial rooms might be filled every school hour, but the desks of the pupils at work elsewhere were empty. The Gary idea was to arrange a schedule so that every room and the hall would be in use every school hour. I believe two sessions a day for two sets of scholars, and summer school also, were included in the plan to make the schools work every day, all day, and all the year. This is mentioned merely as indicative of the fact that citizens were beginning to question the increasing cost of schooling and schools, and educators were trying to answer their questions.

Before 1914 careful study had been made, in various parts of the country, of the requirements for the three types of school, lower elementary, upper elementary, and high, and an attempt to arrive at a standard of cost for each one of the three. This was done with some success for the elementary schools. The lower, with classrooms only and no principal, cost \$140 per pupil. The upper elementary, with principal, hall and industrial rooms, as well as classrooms, cost \$180. The high school was another matter. Its cost was from \$400 to \$600 and \$700;—an enormous jump from the elementary. The worst of it was that there were an increasing number of pupils going on to high school, and as the teaching was equally expensive, the burden was becoming very heavy. One curious reason for the great cost of the high school was that the home-room system of the elementary was continued in the high,



Frick Junior High School, Oakland, Cal.

Blaine & Olson, Architects



FRONT ELEVATION OF SCHOOL BUILDING

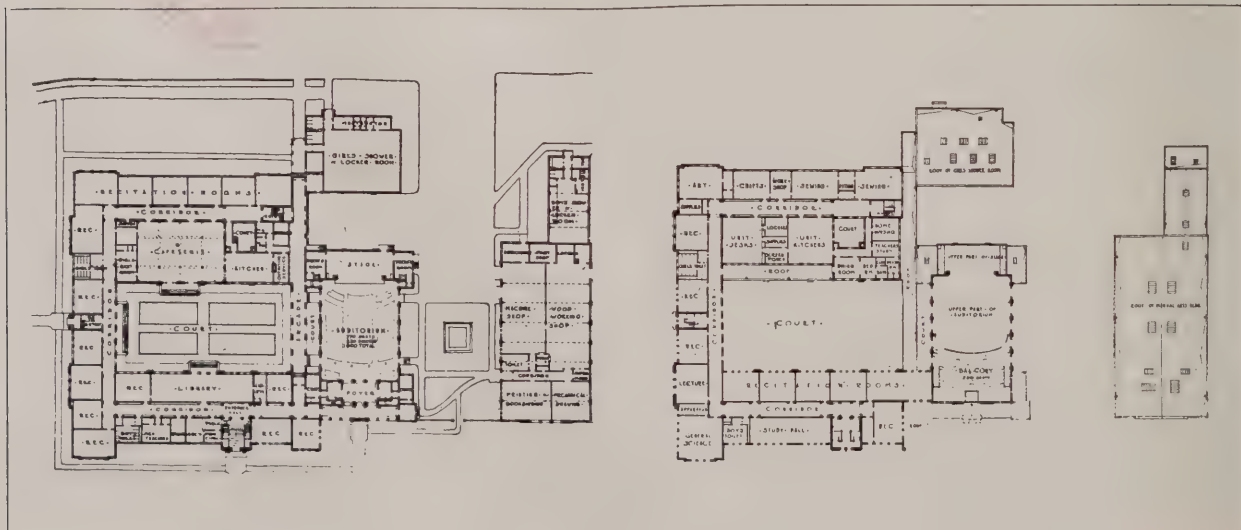


AUDITORIUM ENTRANCE

COST AND CONSTRUCTION DATA

This junior high school was built in 1922 at a cost of \$340,000 or 20.9 cents per cubic foot. It will accommodate between 1200 and 1400 pupils and has equipment costing \$50,000.

The interior partitions are of metal lath and plaster on wood studs, and the stairways are of fireproof construction. The exterior finish is stucco on masonry walls.



FIRST FLOOR

SECOND FLOOR

THEODORE ROOSEVELT JUNIOR HIGH SCHOOL, SAN DIEGO

T. C. KISTNER & CO., ARCHITECTS



FRONT ELEVATION

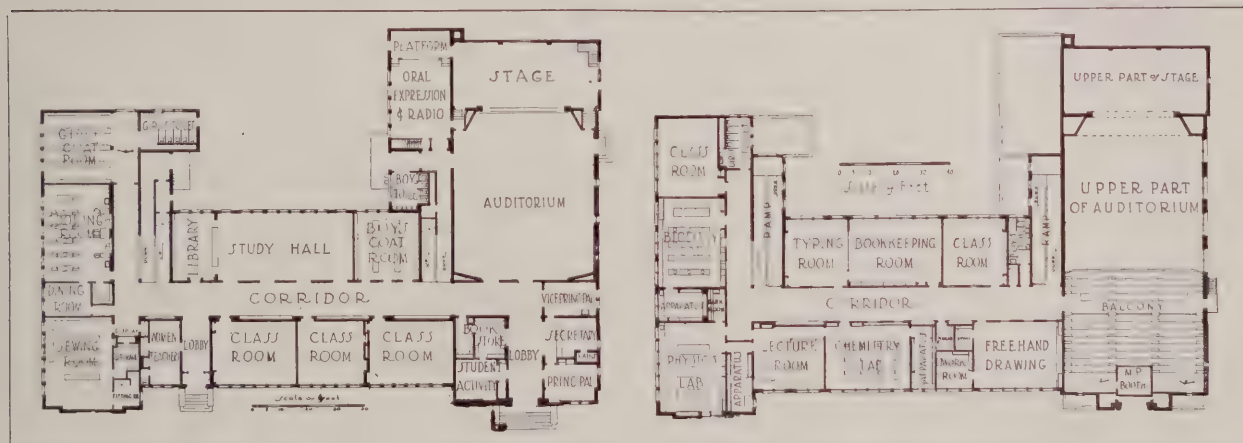
COST AND CONSTRUCTION DATA

Costing \$198,700 or 24 cents per cubic foot, this school building was erected in 1924 to provide facilities for 400 students, making the cost per student about \$497. Equipment costing \$25,000 has since been installed.

The construction is reinforced concrete with an exterior finish of stucco, and the roof is of terra cotta tile. All corridors, ramps and stairways are of fireproof construction, and the interior trim is Douglas fir with hardwood doors.



DETAIL OF MAIN ENTRANCE



FIRST FLOOR

SECOND FLOOR

MOUNTAIN VIEW UNION HIGH SCHOOL, SAN FRANCISCO

W. H. WEEKS, ARCHITECT

and every pupil had his 26-inch desk in his home room, which was vacant a good part of the time while the pupil was elsewhere, or occupied by some other pupil; whereas in the grammar, there were but two places outside the classroom where a pupil might be,—woodworking or cooking; in the high school there were half a dozen or more, so that the pupil was more often out of his room than in it. The obvious remedy was to do what was being tried at Gary, even in the elementary school,—make the rooms recitation rooms or study rooms, and let the pupils keep books etc. elsewhere. School authorities were loath to give up a system to which they were accustomed, and discussion was going on over the costly high school, when attention became focused on a solution which touched the elementary, as well as the high, and seemed not only logical but economical.

In the grammar, but two grades, seven and eight, had industrial work. The other two were educationally on the same basis as the lower elementary. Why not put these with the four lower grades in the less expensive building? If the first grade of high were withdrawn and put with grades seven and eight, one would have a school in which all grades would be taking industrial work, all would be about to change from the home room to the departmental recitation room, and the schedule could be so arranged that every room would be occupied at every period by a class. The hall might well serve as a place for physical exercise, for which there was now a general demand; so shops, hall and recitation rooms would be fully occupied. This school was the intermediate or junior high. It was to be the stepping stone between the elementary and the high. There would be no expensive science department, nor commercial, such as was in the high, and the hall would be simply a large room for physical exercise and occasional meetings. One has noted already the economy of putting grades five and six into elementary buildings. There was a further economy in putting grade nine into a building less expensive than the high school.

The problem before the architect then, was to build to fit these conditions. They were not new; it was nothing but the old grammar school with slightly increased industrial teaching and with the hall planned to serve as a gymnasium. It should have cost little more than the grammar. The figures quoted are pre-war figures. They had been practically constant for ten years. When school building was renewed after the war, communities had got accustomed to rising prices, and before we entered the war they were far above 1914 (150); but then they jumped unexpectedly and soared with all building to the peak in 1920 (250), and then slowly receded, until today the factor is two as compared with 1914. If we apply the factor of 250, to allow for added industrial equipment, to the 1914 prices, upper elementary \$180, we get \$450 for the junior high. The actual costs of the junior high, which have never been in any way stabilized any more than the require-

ments, have run from \$400 to \$700, and in cases even more, but the low figure represents a building in essentials nothing but the old grammar.

The taxpayer certainly has a right to inquire the reason of this and to ask if anything has been obtained equivalent to the cost. Hitherto it is the building cost alone that has been mentioned, but the teaching has also increased in cost and for the same reason. Miscellaneous industrial work of every description and larger and more elaborate auditoriums and gymnasiums have been demanded and provided in these junior high schools, which was never contemplated in the original plan. That was a simple but comprehensive plan of economy; the present junior high is an elaborate and expensive addition to the school plant, requiring more teachers as well as the expensive plant. It will be seen that many of the buildings here shown provide gymnasiums in addition to halls and sometimes two, for boys and girls, and dressing rooms and showers are provided. Whether or not all this equipment is required is not a question for the architect. He is not supposed to know the educational end of the problem but merely to provide the rooms required. It is thus that the new elaborate and costly buildings have grown. It is an ungracious, as well as unprofitable task, for an architect to point out to his employer how to economize, and yet the architect is the only one who knows enough about the economy of planning to be able to lead the community to a clear understanding of the subject of school costs; and if by wise economies in the plan he can save for the beauty of his building, it is certainly time well spent.

At the risk of repeating what architects already know, there might be mentioned two fundamental factors in the economy of planning a school building: (1) Have no area larger than is required for its purpose, and of course no area that is useless. (2) Have no unnecessary height. This results in a compact plan, in both area and cube. It seems at first sight simple to follow these rules. It is not. School authorities will often determine the sizes of rooms, and a study of the requirements of the rooms, with a view to modifying the dimensions, is neither required nor allowed. Needless area is often provided due to this. At the time when sizes of classes were reduced (from 56 to 42), many teachers urged that the sizes of rooms should be retained, nor did it occur to the educational authorities that a building with 500 children in 12 rooms would cost more than one housing them in ten rooms. One of the most fruitful sources of waste was in corridors. On the theater principle, corridor widths are determined by the numbers using them. Applying this, quite wrongly, to schools, regulations fixed legally the minimum width of corridors. The children file out, and a corridor in excess of what is necessary for two double files is not only wasteful but dangerous as likely to cause disorder. The same thing applies to stairs. It would have been more reasonable if the law had limited the width and fixed the maxi-

mum, but better still if such matters were not put on the statute books, to become obsolete or ridiculous. Some of the legal requirements about air have no longer a semblance of any relation to health.

One touches on these things because in many cases the casual citizen seeing a school of some architectural beauty at once concludes that it is this, to him useless or at least unnecessary beauty, which is making the costs of schools mount. It is nothing of the kind. The cost is due to what is in the building, the wastefulness of its plan, its elaborate and costly equipment of halls whose use, by the schools, hardly justifies the expense; the gymnasiums for boys and girls, baths, and swimming pools. Consider for a moment the baths. The ordinary physical exercises are school routine, and in many places at least are not such exercises as require a complete change of clothes or a bath. In such schools the bath equipment need be only sufficient for athletic teams. Even here the girls' equipment is costly, as girls are not expected to bathe or dress together, and must have individual dressing rooms and lockers.

There is often no standard in a state, or even in a city, as to what industrial equipment should be provided. One school will have two or three classroom units for the boys' and about the same for the girls' industrial; another will have double this amount. One expects to find the second a larger school, but often it turns out to be smaller. It is, or should be, obvious that these industrial class subdivisions should be in a definite ratio to the number of pupils in the school, as a half-class generally is the standard in an industrial room. In the same way the capacity of the hall would be in proportion to the size of the school, to seat half the school, or the whole; to take double units or single on the floor for exercises, and so a standard would be established. If the hall is to be used by the town or city as a general auditorium, it is hardly fair to build it at the cost of the school appropriation. The school use alone would not justify the large halls here shown. Again the gymnasium. It is ideal to have a hall and separate gymnasium for boys and girls. If the building accommodates 3,000 to 4,000 pupils, such equipment is justified. If the building has less than 1,500, perhaps one gymnasium would have to serve. If 1,000 or less, a combined assembly hall and gymnasium would seem the reasonable limit.

A glance at the plans of junior high schools illustrating this article and in the foregoing plate section will show exactly what is meant. The Stevens, Glens Falls, the Lincoln and Kearney schools are more or less the same size. The Stevens has for hall and gymnasium 73 x 120, the Glens Falls 80 x 130, the Lincoln 70 x 120, Kearney 80 x 144. Not even the smallest of these is justified by the size of the school or needed for school purposes. Some have assembly hall and gymnasium combined, using a deep stage for the gymnasium. The hall is not available when the gymnasium, behind a movable partition, is in use, and the stage, provided by open-

ing this partition, is useless in size. Kearney takes this overgrown stage for the boys and then has another gymnasium over the cafeteria for the girls. Glens Falls has a very large dressing room and bath equipment and swimming pool, which the others have not. There is no standard, and this one unit in all these plans is the large item in expense. California is lucky. All this is done out of doors. A couple of one-story locker and bath buildings and the open air,—and the gymnasium problem is solved.

On the next count, industrial equipment, there is still less correspondence. The Fall River School has perhaps the largest, with wood working, metal working, drawing, printing, textiles, etc. for boys; and sewing, millinery, cooking, household science and drawing for the girls; a general science and special music room and library as well.

As against this at the other extreme, the Thaddeus Stevens has a shop for boys, two for girls and a science room,—hardly more than would have gone into a grammar school of this size 20 years ago. The Glens Falls school seems more like a town hall, with a few classrooms added as an afterthought. If the plans of Glens Falls and Fall River are put side by side, one cannot believe them to be solutions of the same problem. Still both are called "junior high."

The North Park Junior High was planned for by a superintendent and school committee who knew just what educational end they were aiming for in Fall River. It may not apply anywhere else, and it may not be the solution of a junior high. It is at least a genuine attempt to obtain junior high accommodation without extravagance. A brief description may be of value. Of the three grades, about 400 each to be housed, the seventh was put in home rooms with wardrobes, the other two, eight and nine, had lockers for books, and were on the departmental system, going to recitation rooms. The hall was arranged so that the floor clear of the galleries was large enough for 70 to exercise; and chairs, in place elsewhere, would provide for morning service. The expense of baths and lockers was definitely faced and accepted, and the boys and girls have a period long enough to include a bath. Two other exercising spaces were provided,—one on the hall roof, and one in the enclosed and paved courtyard. Unusual and costly features were included to meet definite demands,—a public library branch, an extra small hall, and a good sized music room. The cost of these does not really belong to the school. Otherwise it is a junior high where the amount of industrial equipment is justified by its location in a mill town.

To complete the comparison, this is the cost per pupil in Thaddeus Stevens, North Park, the Lincoln and Glens Falls;—The Thaddeus Stevens accommodation is 915, cost \$409,127, \$450 per pupil. The North Park accommodation is 1200, cost \$685,000, \$570 per pupil. The Lincoln accommodation, 780, cost \$410,000, \$520 per pupil. The Glens Falls accommodation, 890, cost \$360,000, \$400 per pupil.



GENERAL VIEW

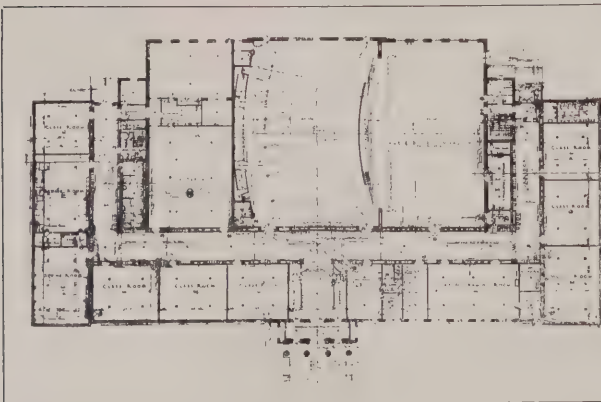


ENTRANCE PORTICO

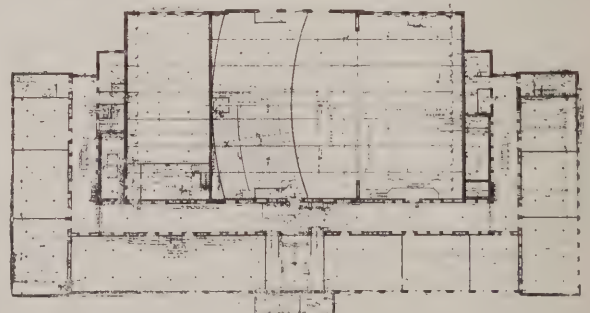
COST AND CONSTRUCTION DATA

This high school building was completed in December 1925 at a cost of \$216,000, or 20.4 cents per cubic foot. The cost of equipment installed in the building was \$20,000, and it is designed to accommodate 750 pupils, making a cost per pupil of \$288.

All corridors, classrooms and stairways are of fireproof construction. The roof structure is of wood, and the interior finish is of oak with oak floors in the classrooms. The exterior walls are of face brick with stone trim.



FIRST FLOOR



SECOND FLOOR

HIGH SCHOOL, KEARNEY, NEB.
DAVIS & WILSON, ARCHITECTS



GENERAL VIEW

COST AND CONSTRUCTION DATA

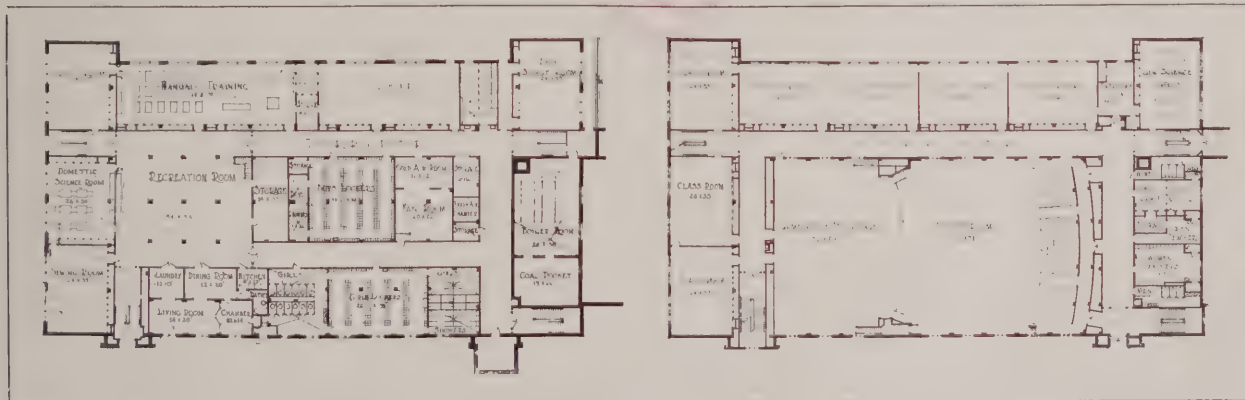
Completed October 1, 1925 at a cost of \$409,667 or 37.7 cents per cubic foot, this school building has a capacity of 900 pupils, making a unit cost of about \$455. The cost of the equipment installed was \$24,136.

The exterior walls are of waterstruck brick, and the pitched roofs are of red Spanish tile, while the flat roofs are covered with tar and gravel composition.

The interior is of fireproof construction as regards floors, corridors and stair towers.



MAIN ENTRANCE BAY



BASEMENT

FIRST FLOOR

LINCOLN JUNIOR HIGH SCHOOL, MALDEN, MASS.

JAMES H. RITCHIE & ASSOCIATES, ARCHITECTS

The accommodations given here are not what were given by the architects,—some are higher, some lower. There are many ways of taking off accommodations in a junior high, and some of these returned by the architects were so obviously low, while others were obviously high, that it seemed fairer, if a comparison were made, to take them off on the same basis; namely, full quota for classrooms, half units for the industrial rooms, and double classroom unit for the gymnasiums. All these have cost the tax payers about the same per pupil, but in some cases the town has paid for a hall and in others for a school.

One has attempted to prove for the sake of the schools, for the sake of the tax payer, and for the sake of the community, that it is not architectural beauty, either within or without that caused the high cost of such schools as these, but the inclusion of costly space or equipment. There is nothing more vital in the life of the child than being surrounded by beauty. The Thaddeus Stevens school must leave its impress consciously or unconsciously on the children. Although the designer of a school building is somewhat hampered by the necessities of light, that is the architect's opportunity, and our many good buildings are sufficient evidence that the schools can be made fine examples of design. Not sufficient emphasis

has been placed on the beauty desirable in the interior. Classrooms have been cursed by the necessary blackboards; one believes that a needless amount has been demanded everywhere; but surely in the junior high the recitation room, under the guidance of its teachers of English or of geography, might well be made a room that would be more like a charming home study or library than a classroom.

Editor's Note.—It is of little use for architects to practice economy in the preparation of their specifications and in their plans and elevations for school buildings if politicians are going to influence and control the selection of contractors; and too often it happens that contracts have been let on carefully planned and specified buildings for definite amounts of money and appropriations of sufficient amounts made by municipal governments, only to have costs tremendously increased during the progress of the work by so-called "extras" claimed by politically subsidized contractors. Often have thousands of dollars in pure graft been added to the costs of school buildings on the pretext of including extras, which are usually unjustly charged to the oversight of the architects. Graft-ridden communities can never expect to get the full value of money expended on schools and town halls.



Brimmer School for Girls, Boston

R. Clipston Sturgis, Architects



Photos. Frances Benjamin Johnson

GENERAL VIEW



CORRIDOR ENTRANCE



WINGS TO BE ADDED

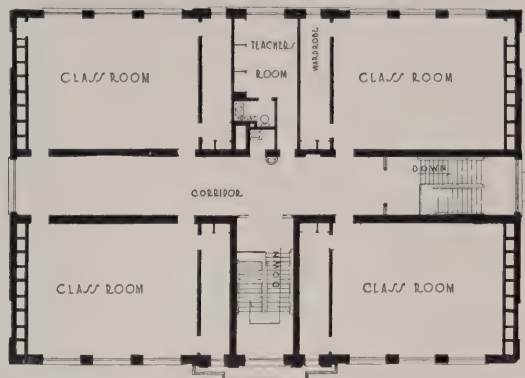
Plans on Back

WASHINGTON GRADE SCHOOL, SOUTH MANCHESTER, CONN.
FRANK C. FARLEY, ARCHITECT; WILLIAM HARMON BEERS, ASSOCIATE ARCHITECT

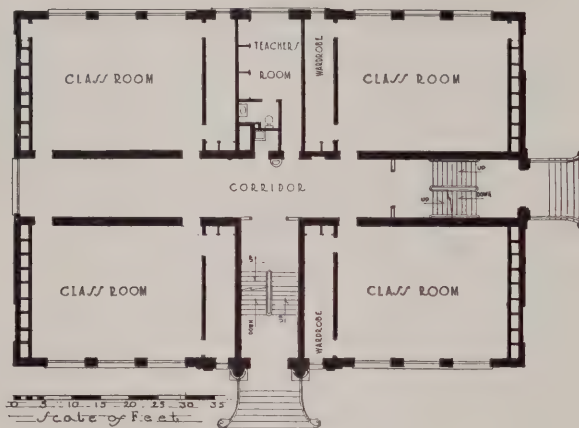
COST AND CONSTRUCTION DATA

Having a capacity of 360 pupils, kindergarten to eighth grade, this school was built in 1915 at a cost of about \$55,000 or about 19 cents per cubic foot.

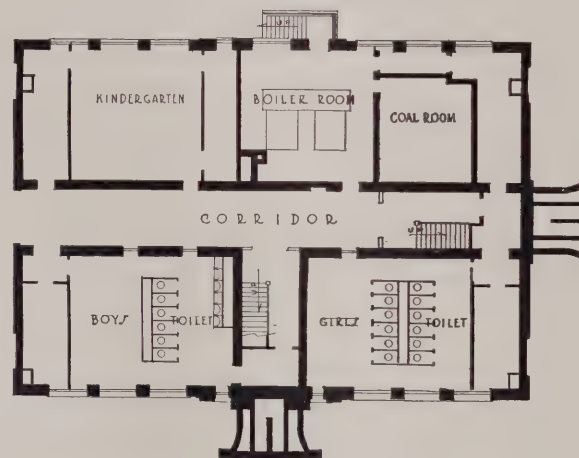
It is constructed of common brick with cast stone trim and slate roof. The floors are of reinforced concrete, and the roof structure consists of steel trusses and wood rafters.



SECOND FLOOR



FIRST FLOOR



BASEMENT

PLANS, WASHINGTON GRADE SCHOOL, SOUTH MANCHESTER, CONN.
FRANK C. FARLEY, ARCHITECT; WILLIAM HARMON BEERS, ASSOCIATE ARCHITECT



Photos. Barrett Photo. Co.

GENERAL VIEW FROM THE WEST



SOUTH ENTRANCE



MAIN ENTRANCE

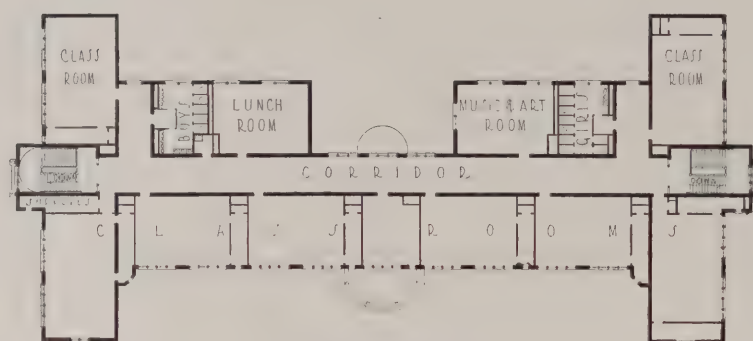
Plans on Back

BOULEVARD SCHOOL, CLEVELAND HEIGHTS, OHIO
WARNER, McCORNACK & MITCHELL, ARCHITECTS

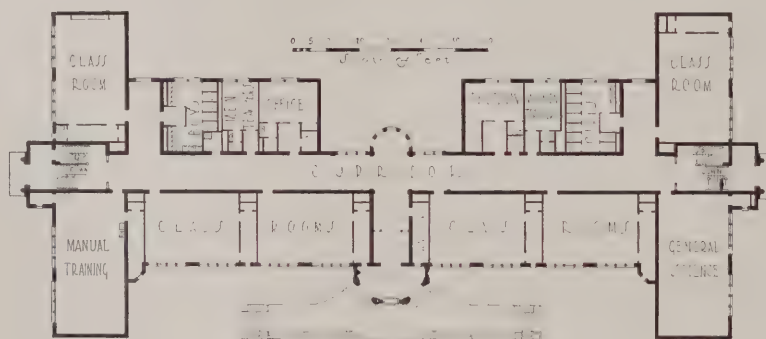
COST AND CONSTRUCTION DATA

Completed in 1924, this school was built to accommodate 570 pupils at a cost of \$267,379, not including the heating plant, gymnasium or auditorium, which are in separate buildings nearby. The cubic foot cost of the main building was 56 cents.

The construction is fireproof, the exterior walls being of brick and stone with terra cotta trim. The roof is covered with a composition of tar and gravel.



SECOND FLOOR



FIRST FLOOR

PLANS, BOULEVARD SCHOOL, CLEVELAND HEIGHTS, O.
WARNER, McCORNACK & MITCHELL, ARCHITECTS



GENERAL VIEW, REAR ELEVATION



FRONT FACADE



SIDE ENTRANCE

Plans on Back

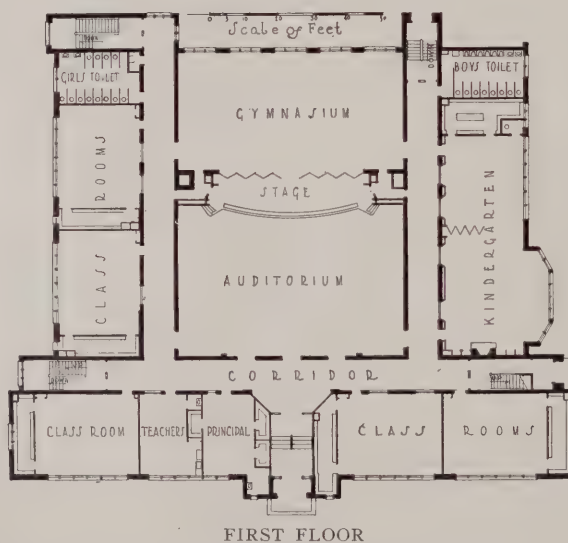
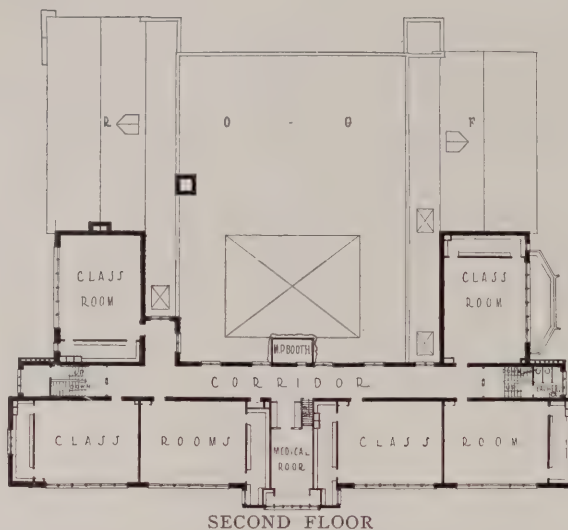
TUSCAN ROAD SCHOOL, MAPLEWOOD, N. J.

GUILBERT & BETELLE, ARCHITECTS

COST AND CONSTRUCTION DATA

Built to accommodate 660 pupils, this building cost \$281,782 or 41.75 cents per cubic foot and was completed in 1925.

It is of slow-burning construction and has an exterior finish of brick with limestone trim. The sloping roofs are covered with slate, while the flat roofs have a pitch and slag composition covering.



PLANS, TUSCAN ROAD SCHOOL, MAPLEWOOD, N. J.
GUILBERT & BETELLE, ARCHITECTS



GENERAL VIEW



DETAIL OF END BAY
JOHN L. SHEARER GRAMMAR SCHOOL, NAPA, CAL.
W. H. WEEKS, ARCHITECT



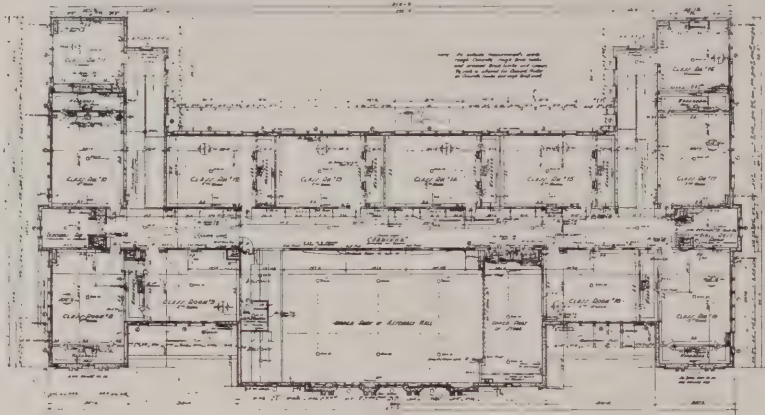
CENTRAL PAVILION

Plans on Back

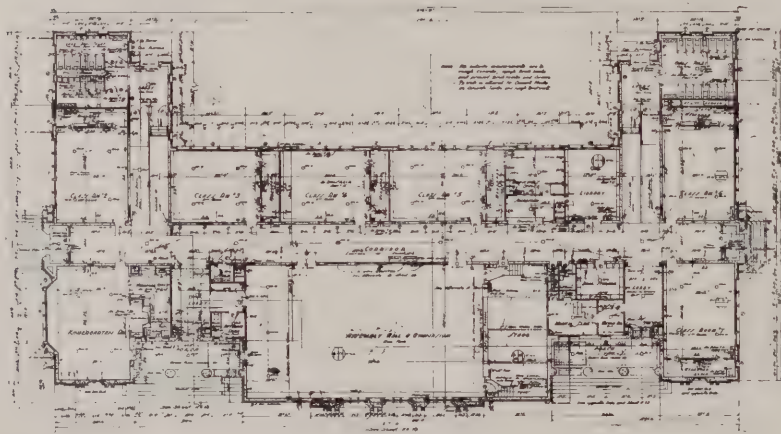
COST AND CONSTRUCTION DATA

This school was finished in 1923, being planned to accommodate 550 students at a total cost of \$152,000 or 21.5 cents per cubic foot.

The construction is fireproof, the exterior being of pressed brick with terra cotta trim and slate roof.



SECOND FLOOR



FIRST FLOOR

PLANS, JOHN L. SHEARER GRAMMAR SCHOOL, NAPA, CAL.
W. H. WEEKS, ARCHITECT



Photos. Gabriel Moulin

FRONT ELEVATION



YARD LOGGIA



YARD ENTRANCE

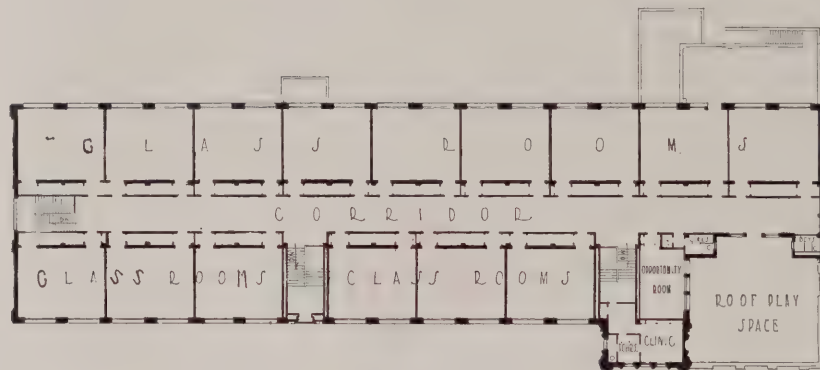
Plans on Back

ALAMO SCHOOL, SAN FRANCISCO
J. R. MILLER & T. L. PFLUEGER, ARCHITECTS

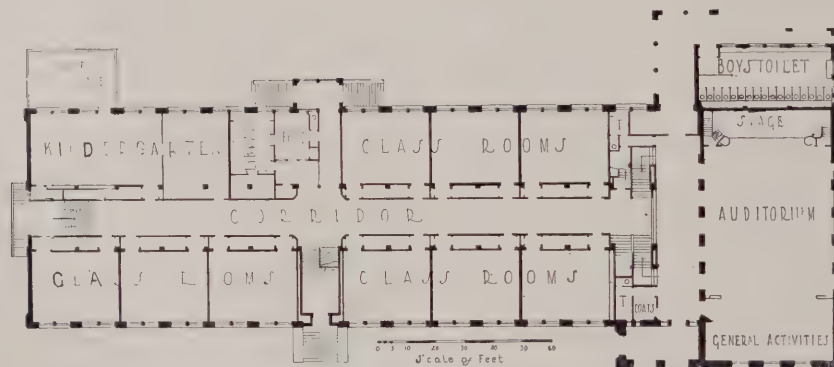
COST AND CONSTRUCTION DATA

This building was built to accommodate 1000 pupils and was completed in October, 1926 at a total cost of \$371,661.51, making the cost per pupil \$371.66. The equipment cost was \$6,300, and the cubic foot cost of the building 38 cents. Owing to difficult physical conditions incident to this particular site and plan, these figures do not furnish a fair comparison with other similar work.

The construction is fireproof, being of concrete with steel frame, concrete floor and roof slabs, and stud partitions covered with metal lath and plastered. The exterior finish is brick and terra cotta, and the roof is covered with composition.



SECOND FLOOR



FIRST FLOOR

PLANS, ALAMO SCHOOL, SAN FRANCISCO

J. R. MILLER & T. L. PFLUEGER, ARCHITECTS



Photos. Richard B. Hoit

GENERAL VIEW



ENTRANCE DETAIL



SIDE ENTRANCE DETAIL

Plan on Back

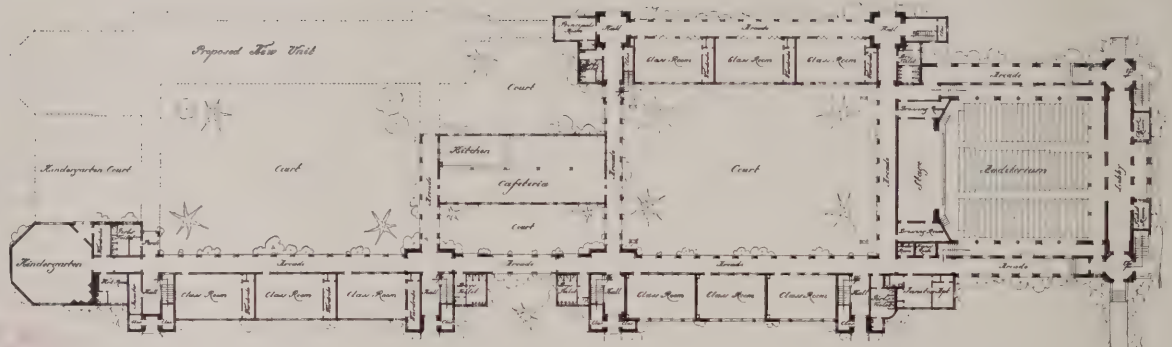
CORAL GABLES ELEMENTARY SCHOOL, CORAL GABLES, FLA.

KIEHNEL & ELLIOTT, ARCHITECTS

COST AND CONSTRUCTION DATA

Completed in September, 1926 at a cost of 35 cents per cubic foot, this school accommodates 700 pupils. The total cost of the equipment was \$22,000.

The walls are of masonry, and the roof is of wood construction covered with tile. The corridors on the first and second floors are of fireproof construction.



PLAN, CORAL GABLES ELEMENTARY SCHOOL, CORAL GABLES, FLA.

KIEHNEL & ELLIOTT, ARCHITECTS

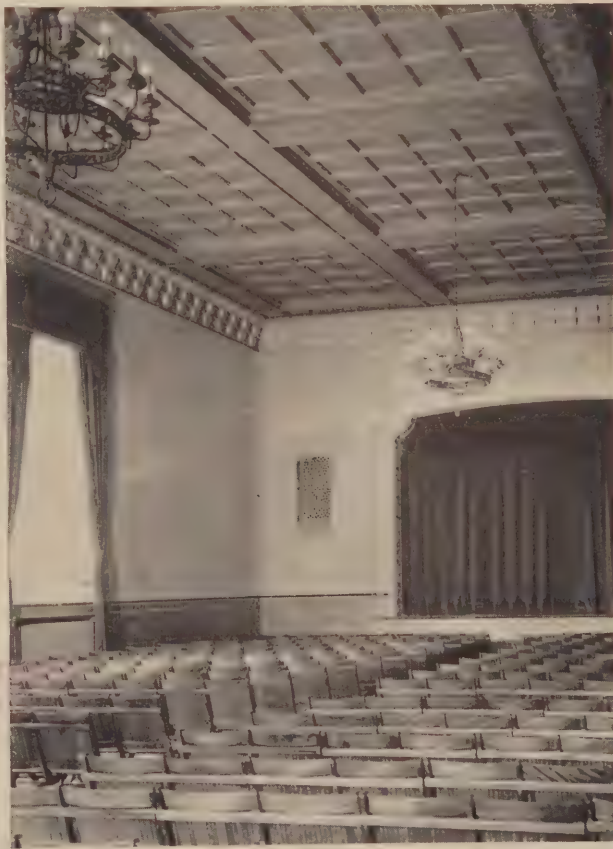


EAST ELEVATION SHOWING PLAYGROUNDS



Photos. Gabriel Moulin

MAIN ENTRANCE DETAIL



INTERIOR OF AUDITORIUM

Plans on Back

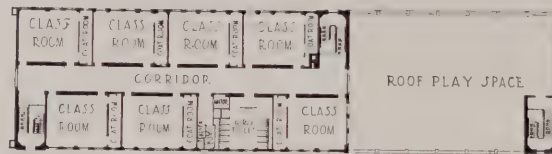
RAPHAEL WEILL SCHOOL, SAN FRANCISCO, CAL.
FREDERICK H. MEYER, ARCHITECT

COST AND CONSTRUCTION DATA

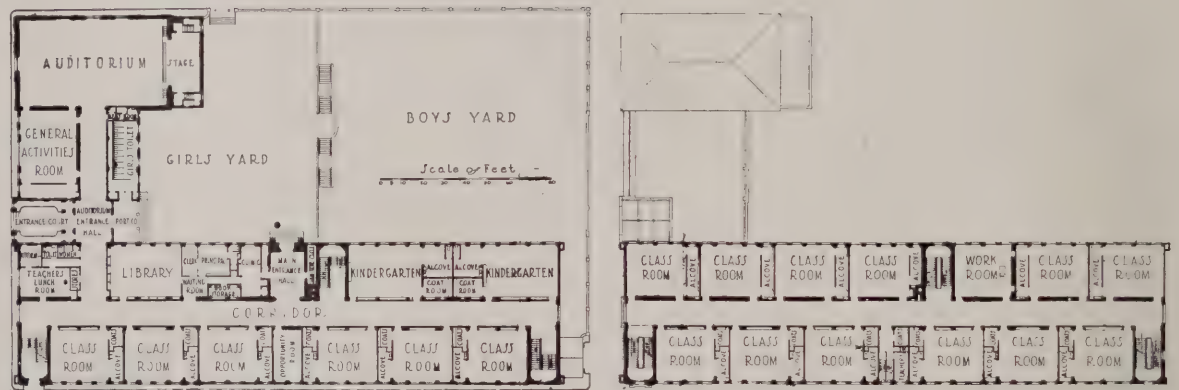
This school was completed in February, 1927 at a total cost of \$358,990 and is planned for 1100 pupils, making the cost per pupil \$326.35 and the cubic foot cost 35.9 cents.

The cost of equipment was \$6,800 or \$6.20 per pupil.

The building is of reinforced concrete construction with stud partitions. The stairs are of concrete and are enclosed in fireproof concrete towers. The interior trim is Oregon pine, stained brown.



THIRD FLOOR



FIRST FLOOR

SECOND FLOOR

PLANS, RAPHAEL WEILL SCHOOL, SAN FRANCISCO

FREDERICK H. MEYER, ARCHITECT



FRONT ELEVATION



Photos. Dix Duryea

SIDE ENTRANCE



MAIN ENTRANCE

Plans on Back

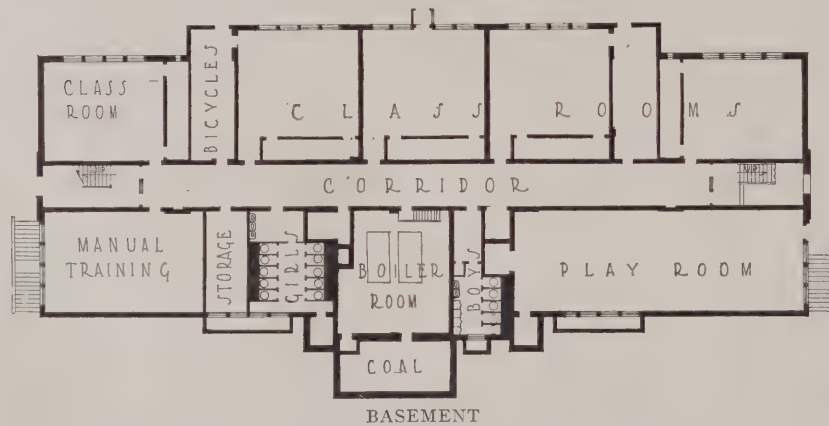
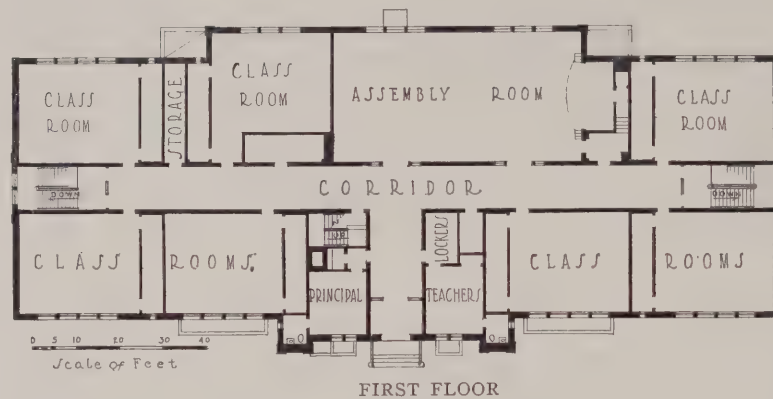
CENTRAL GRADE SCHOOL, GLEN RIDGE, N. J.

GOODWILLIE & MORAN, ARCHITECTS

COST AND CONSTRUCTION DATA

At a total cost of \$189,000 or 48 cents per cubic foot this school was completed in March, 1925. The number of pupils to be accommodated is 420, making a cost per pupil of \$450.

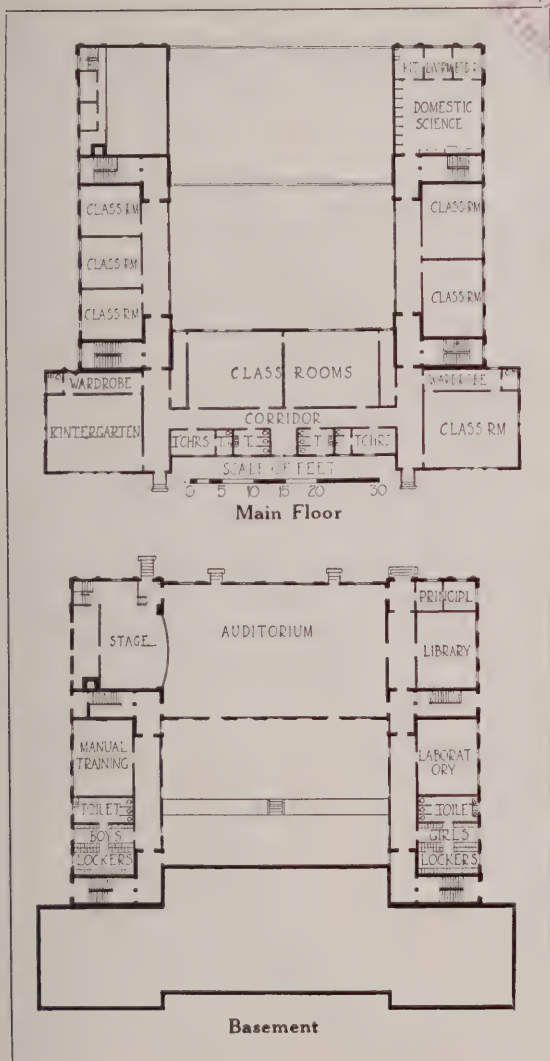
The exterior walls are of brick and cinder concrete with tile backing. The floors are reinforced concrete, and the roof is formed of slow-burning timbers with metal lath and plaster underneath and mission tile on the upper side.



PLANS, CENTRAL GRADE SCHOOL, GLEN RIDGE, N. J.
GOODWILLIE & MORAN, ARCHITECTS



GENERAL VIEW FROM ENTRANCE DRIVE



END BAY ON LOWER LEVEL

In an article on school houses of moderate size which appeared in THE ARCHITECTURAL FORUM for July, 1925 an illustration and plans of the upper part of this hillside school building were shown. This is the portion outlined in black in the basement plan. As the wings and auditorium are built on the lower grade, upper and lower approaches to the building are possible, and the principal entrances are on the ground level.

GRADE SCHOOL, SOUTHERN PINES, N. C.
AYMAR EMBURY II, ARCHITECT

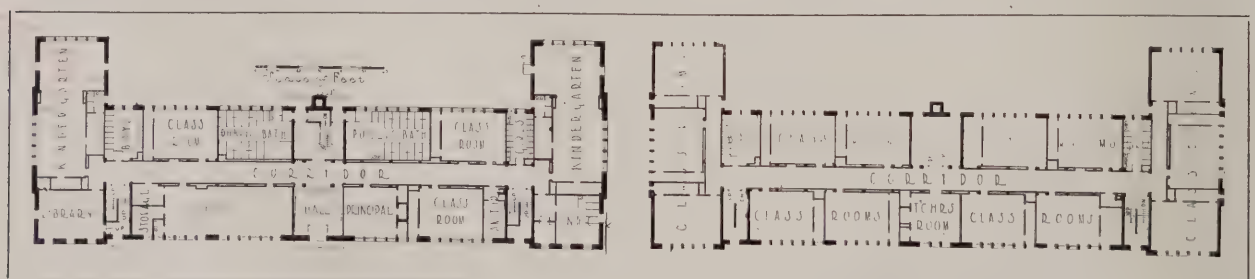


FRONT ELEVATION

This building is an excellent example of the adaptation of southern European precedent to the purposes of modern American school architecture. The long rows of classroom windows across the facade of the building are treated with engaged limestone columns, as facing for the mullions, supporting false arches in the brickwork above the windows which gives the effect of galleries or loggias across the entire second and third stories, the windows being recessed somewhat to heighten this effect. The center portion of the building has a fourth story consisting of a large covered play space and two open-air classrooms. The play space is open at the front and rear, and the colonnades forming these openings add still further to the gallery effect. The wings at either end of the building have parapets with iron railings and are paved with wood blocks, forming two additional open-air roof playgrounds. The exterior walls of the first story are of Indiana limestone, the upper portions being finished in brick with consider-

able limestone trim. The southern European effect of the whole is completed by the sloping roof which is of terra cotta tile.

Ample classroom and recreational space is provided for 1400 pupils, the first three floors being devoted almost entirely to classrooms, while the play space is on the fourth floor as already said. Another unusual feature of the plan is that the two shower rooms on the first floor are public baths. The construction throughout is fireproof, the only wood used being window frames and the finished floors in classrooms and play spaces. The bearing walls are brick and interior columns reinforced concrete. The floors are reinforced concrete of the tin pan type finished with terrazzo in the corridors and toilets. Partitions are of terra cotta and gypsum tile. Work on this building was completed about March 1, 1924, and the total cost was \$481,329 or about 37.1 cents per cubic foot. Figured on the basis of a 1400-pupil capacity, this makes a cost of about \$344 per pupil.



FIRST FLOOR

SECOND FLOOR

CHARLES CARROLL OF CARROLLTON SCHOOL, BALTIMORE
BUCKLER & FENHAGEN, ARCHITECTS



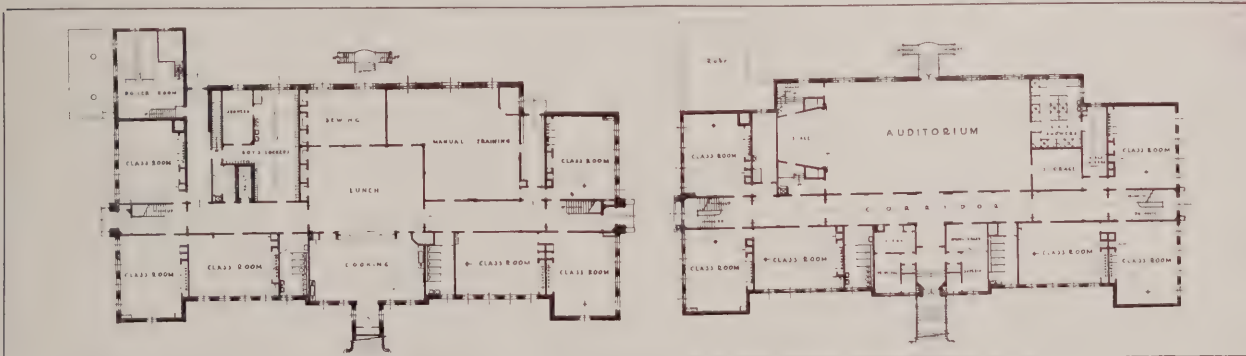
GENERAL VIEW

The Georgian Colonial type of architecture is particularly adaptable to modern school construction where great areas of classroom windows occur in connection with large blank wall spaces, the monotony of which must be relieved in such a way that they form a pleasing part of the whole. The school building illustrated herewith is a very good example of how this can be done, keeping the design in good taste without sacrificing any of the practical considerations of lighting and layout. The exterior treatment is carried out in red brick trimmed with limestone and has wrought iron railings and iron lamp posts at the front entrance steps.

The plans provide accommodation for 600 pupils, and provision is made for extensive future additions in the rear whenever it shall become necessary to expand. There is, in addition to the 17 standard classrooms, lunch rooms, rooms for sewing, cooking,

manual training and a library, and a large combined gymnasium and auditorium with a seating capacity of nearly 700. There are also office suites for the superintendent and principal, including waiting rooms, private offices and toilets. The clinic is complete and well equipped, and there are ample locker and shower rooms, and toilet rooms on all floors. Although some of the classrooms are on the basement floor, these are all above natural ground level.

The boiler room, stairways, and corridors are all fireproof construction, and the roofs are of tar and gravel composition. The building was completed in October, 1927 at a cost of \$230,000 or 36.6 cents per cubic foot. Had it been built with all floors and roof fireproof, the cubic foot cost would have been about 39.4 cents. Equipment costing \$19,000 has been installed in the building. The cost of the school as it was built was about \$383 per pupil.



BASEMENT PLAN

FIRST FLOOR PLAN

RICHMOND SCHOOL, DANVERS, MASS.

CHARLES G. LORING, ARCHITECT



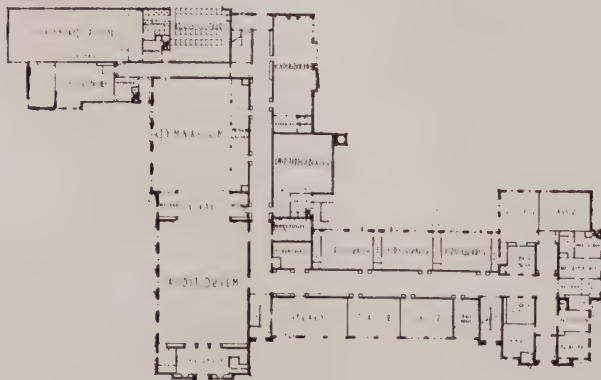
ELEVATION OF ROBERT R. MCCORMICK SCHOOL

ERNEST SIBLEY
ARCHT. & ENGRS.
CHICAGO, ILL.

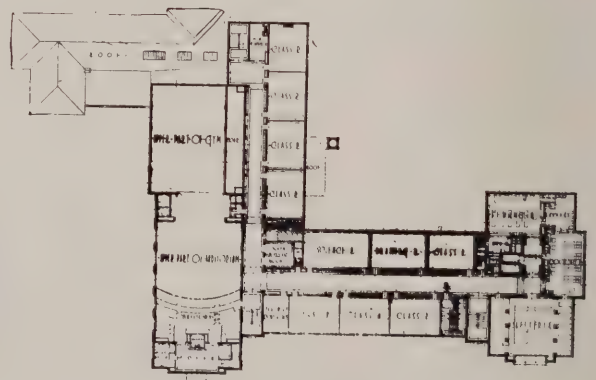
TOWER AND SIDE ENTRANCE



AUDITORIUM ENTRANCE



FIRST FLOOR



SECOND FLOOR

LINCOLN SCHOOL, TRENTON, N. J.
ERNEST SIBLEY & LAWRENCE C. LICHT, ARCHITECTS

SCHOOL GROWTH IN SOUTHERN CALIFORNIA

BY
JOHN C. AUSTIN
ARCHITECT

DURING the past ten years the population of southern California, and more particularly Los Angeles, has increased at such an unprecedented rate that one hesitates to tell of it, fearing that those who read or hear about it will consider it just that much "more southern California 'bunk.'" Yet the federal government, in preparing its annual estimates of the population of cities, usually omits Los Angeles on the ground that it is gaining so fast it is practically impossible to arrive at a fair estimate. Carefully compiled statistics actually show that the average daily attendance in Los Angeles schools of all grades was for 1920 to 1921, 160,278; 1924 to 1925, 274,263; 1926 to 1927, 329,538. These figures have been furnished by the Los Angeles Board of Education and are authentic. Therefore, they represent the actual growth of the school population, and are not a part of the propaganda often employed by real estate dealers to boost their business.

Money derived from bond issues can be used only for the purchase of land and the construction and equipment of buildings. No part of it can be diverted for maintenance and upkeep, the cost of which is met by direct taxation. The growth of the Los Angeles school system, as indicated here, is reflected in every school district in southern California in approximately the same proportion. The percentage of increase in daily average attendance in 1927 over 1926 was 8.6 per cent, the year beginning and ending in September. I have taken the average daily attendance as the measure of growth, rather than the enrollment, owing to the number of pupils who may, and usually do, drop out for various reasons. If the enrollment, purely as such, had been considered during the stated period, the actual increase was 9.75 per cent.

Anyone perusing this article need but compare the percentage of growth in his own district with that recorded here to enable him the better to appreciate the difficult and highly important problem now confronting Los Angeles and all of southern California. The \$34,640,000, derived from the last bond issue, of June 3, 1924, was expended in this manner: \$22,000,000 for buildings, and the remainder for sites and equipment.

Notwithstanding the trying experiences involved in her usual efforts to raise such large amounts of money at such frequent intervals, southern California has always insisted on employing substantial and fire-resisting construction. For instance, all corridors and stairways; auditoriums and boiler rooms have fireproof floors, walls and ceilings; exterior walls are of either brick or concrete. Classroom floors and partitions are generally of wood. This was the method of construction quite universally followed until recent ordinances enacted by the author-

ities made it compulsory for all buildings of more than two stories to be of fireproof construction throughout. This action, of course, met with the hearty endorsement of a majority of the architects, who believe it is but a forerunner of what will inevitably follow before long, namely, "that all schools, regardless of size or height, must be absolutely fireproof" to properly safeguard the lives of the children and their instructors. While only the city of Los Angeles is affected by such legislation, it is certain, in time, to exert a wholesome influence on adjacent communities, always ready and eager to copy the older and larger city. Most elementary schools are two-storied, some senior and junior highs three-storied. Therefore, larger sites must naturally be provided than in districts where buildings of greater height are permitted.

The work of qualified school architects has, in many cases at any rate, been recognized, and their services are coming to be more and more appreciated by the school-governing bodies, as they realize that a building with carefully studied, convenient and practical plan and a well designed exterior is by far the most economical kind to construct. They also recognize the fact that good and attractive schools draw new settlers to the districts in which they are located, and that in due course these people become permanent and substantial citizens.

There are included here some illustrations of an elementary school just completed at Beverly Hills, a very popular and rapidly growing community between Los Angeles and the ocean, and considered to be essentially a part of Los Angeles. This building, erected at a cost of \$400,000 exclusive of site and equipment, is situated on a gently sloping knoll with an area of about 6.5 acres. It is contiguous to the grounds of a country club on two sides and borders on fine boulevards on the other two. The general plan is not only unusual, but quite unique, in my opinion, inasmuch as the arrangement separates the younger children from the older and provides each with independent toilet facilities and playgrounds. Special attention is directed to the peculiar requirements of the kindergarten, and first and second grades, in which the rooms were planned primarily to accommodate the equipment and were not considered to be part of a series of classrooms of stereotyped or standard form and size and wholly lacking in individuality. The auditorium seats 750 and has a fully equipped stage, 25 x 52 feet in size, that can be used for concerts, lectures, theatricals, etc., and also for community gatherings as well as for the usual school purposes. The manual training (Sloyd) department consists of a main workshop, rooms for glueing and finishing, lumber storage, tools and sheet metal work, and an instructors' office having full



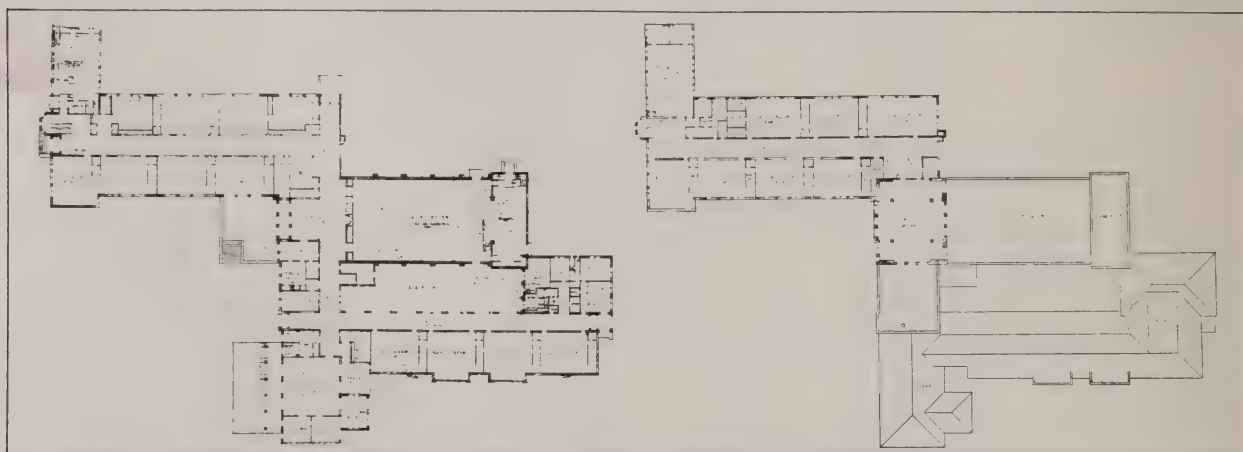
SL, El Rodeo de las Aguas School, Beverly Hills, Cal.

command of the entire department. The domestic science department consists of a workroom, which is sub-divided into a number of small kitchens, special instruction room, locker room, and dining room, pantry and miniature kitchen. Sewing, fitting, work and supply rooms are essential parts of this department.

The grade classrooms from the third to the seventh are alike, but attention is directed to the convenience of coat rooms and supply closets in each and every one. Free textbooks are supplied by the state of California to the pupils of all public schools. Therefore, a special room for them is provided as near the center of the building as possible. The books are distributed to each classroom, and the teacher is held responsible for them. The administration department occupies the center of the building, and has full command of the main entrance and auditorium, also a good view of the boys' playground. The physical director's rooms are located on a mezzanine floor above the administration department, and are easily accessible to or from the first and second stories. The cafeteria will accommodate 300 and is situated in the basement which, owing to the contour

of the ground, is not actually a basement, the floor being level with the finished grade on the east, and splendid light obtained by means of a generous area on the west. I have described this school in detail because it seems to be fairly typical of many erected in this district in recent years. Naturally, while every school cannot have such ideal surroundings, each department in such a school should be arranged to provide every practical convenience contained in this school, known as "*El Rodeo de las Aguas*," Spanish, meaning "the gathering of the waters."

The heating and ventilating of California schools are not as much of a problem as they are in districts where extremes of temperature commonly prevail. Usually the auditorium and the chemistry department are equipped with plenum systems, all other parts being heated by direct steam and ventilated by leaving the windows open from one year's end to another. Every conceivable style of architecture can be found in our school buildings, but those types indigenous to the countries bordering the Mediterranean appear to be in better harmony with the historical background, foliage and climate of southern



First Floor

Second Floor

Plans, El Rodeo de las Aguas School, Beverly Hills, Cal.

John C. Austin, Frederick M. Ashley, and W. Asa Hudson, Architects



El Rodeo de las Aguas School from the Northwest

California, though the Tudor and English Collegiate styles of architecture fit in with many of our picturesque sites and, intelligently handled, readily become a part of the landscape, just as though they had been dropped on the spot. Our costs of construction are very low compared with those of other districts, and for many obvious reasons. All of our building materials, excepting structural steel, are either manufactured or obtained within 50 miles of the building sites, thus enabling our boards of education to stretch their appropriations so as to produce the "most building for the least money" and thereby receive the approbation of the usually critical and

sensitive public. It is no more than 15 or 20 years at most since the use of brick was generally adopted in the construction of our schools in lieu of wood, which is still employed, however, for classroom floors, partitions and roof framing in buildings of under three stories. In a few isolated cases reinforced concrete has been used for interior as well as for exterior walls and, at the present writing, it is common practice to make corridor floors and ceilings, stairways, boiler rooms and (occasionally only) auditoriums of concrete.

As already said, all schools of more than two stories, hereafter erected in Los Angeles, must be



Main Entrance, El Rodeo de las Aguas School, Beverly Hills, Cal.

John C. Austin, Frederick M. Ashley, and W. Asa Hudson, Architects

fireproof throughout, in the sense that such construction is generally understood. Vast improvement has been made in the general planning of grade schools, and in the designing of their exteriors, to which, it is quite evident, much serious study and thoughtful consideration are being devoted. The combination of brick or terra cotta, with natural or artificial stone, the latter predominating, owing principally to its lower cost and the fact that there is no suitable stone in this vicinity except granite, has produced many creditable and attractive schools. These have served to stimulate public interest to such an extent that the people not only expect the standard to be maintained but even raised, whenever conditions should justify the indulgence in schools of higher æsthetic character and value. In fact the public is actually beginning to show signs of education, and seems to be better able to discriminate.

Because of the great size of the Los Angeles school district, much of which is sparsely settled, more schools are required in proportion to population than in a community more densely settled. In some sections the only way to solve the transportation problem has been to build more schools. Schools have had to be provided for large communities where, a few years before, there was only vacant land. The attendance at one school which opened with 100 children increased to 1668 in less than two years, rendering quick action in providing additional buildings imperative. Other similar instances could

be cited, but this seems to be sufficient to convey a faint idea, at least, of the rapidity of school growth.

Again, in a district inhabited by people of the better class, it is possible, through larger returns yielded by the tax, to secure a school fully equipped to meet all requirements of that particular locality, while in less favored districts this is manifestly impossible. I have in mind a case in point. Some years ago I built a high school in Antelope Valley, about 75 or 80 miles from Los Angeles. This section, about equal in area to the state of Rhode Island, was sparsely settled by people, most of whom were practically compelled to live there because of the state of their health and finances. Many were situated at points so remote from the school that we found it necessary to provide dormitories to house those pupils who were unable to go back and forth in time for the sessions. So they would go home on Friday, returning on Sunday, and meanwhile find lodging in the dormitories. On the occasion of my visits there, after the school was completed and in operation, I was amazed to observe the hardy type of children in attendance, and the eagerness with which they tackled their studies. It was certainly a refreshing and unusual sight, considering the fact that most of them came from very poor homes.

In conclusion, I am so bold as to venture the statement that, all things considered, our schools compare favorably with the best in other parts of the country and, in many respects, even excel them.



High School, Los Angeles

John C. Austin, Architect



GENERAL VIEW

Lying as it does in the midst of a broad fertile plain with the mountains for a background, there is a suggestion of northern Italy in the Romanesque treatment of this California school. The general proportions are low-lying and rambling, the main building being laid out in the form of a great L with a cloistered quadrangle in the angle having a large auditorium as its other enclosing wall. The building has been built in two sections at different times and is evidently planned for still further addition in the form of a wing on the right to balance the present wing on the left. Although the greater portion is only one story in height, the rear part of the wing on the left has been carried up a second story to make room for six additional classrooms. Besides having 18 classrooms, the plan provides ample toilet facilities as well as offices, library, auditorium and other rooms for general activities.

The exterior finish is of light colored stucco in combination with light colored variegated brick, used as trim, in which the Romanesque detail is worked out. This in combination with tile roofs gives a southern European effect which is particularly fitting.



MAIN ENTRANCE

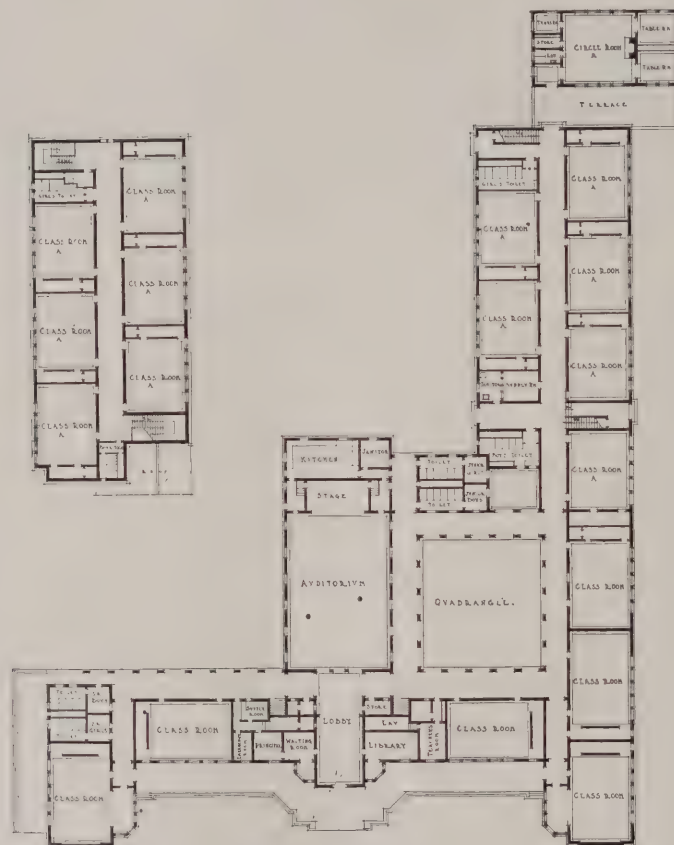
Plans on Back

ANDREW JACKSON SCHOOL, PASADENA
MARSTON, VAN PELT & MAYBURY, ARCHITECTS

COST AND CONSTRUCTION DATA

As originally constructed in 1921, the cost of this school was \$97,550. An addition was made in 1926 costing \$59,670, which makes the total cost \$157,220 or approximately 25 cents per cubic foot. It is planned to accommodate 570 pupils, making the cost per pupil about \$276. The value of the equipment used in the building is \$6,500.

The exterior walls are of brick and stucco; floor joists and partition studs are of wood with metal lath and plaster. The roof covering is tile.



FIRST AND SECOND FLOORS
PLANS, ANDREW JACKSON SCHOOL, PASADENA
MARSTON, VAN PELT & MAYBURY, ARCHITECTS



GENERAL VIEW



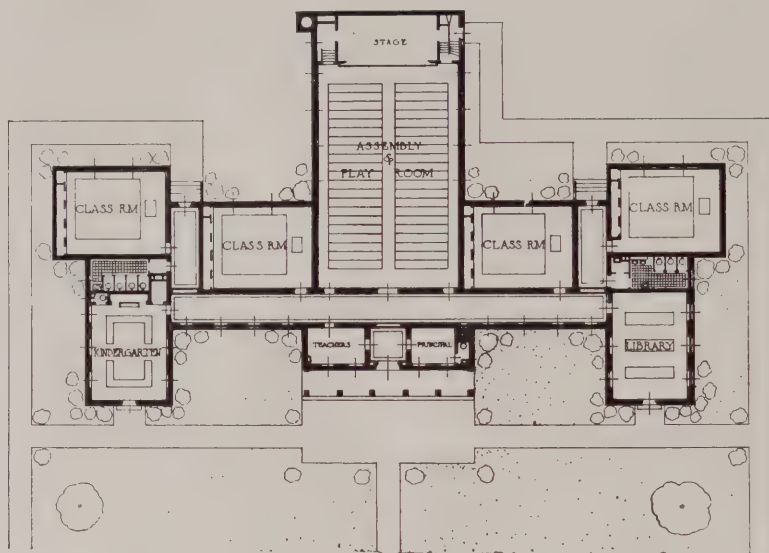
Plan on Back

DETAIL, ENTRANCE PORCH
ELEMENTARY SCHOOL, MASSAPEQUA, N. Y.
ERNEST SIBLEY AND LAWRENCE C. LICHT, ARCHITECTS

COST AND CONSTRUCTION DATA

One hundred and seventy-five pupils may be accommodated in this one-story school building, which was erected in 1926 at a cost of \$76,000 or 37 cents per cubic foot.

The exterior walls are of face brick, and the roof covering is slate.



FIRST FLOOR

PLAN, ELEMENTARY SCHOOL, MASSAPEQUA, N. Y.

ERNEST SIBLEY AND LAWRENCE C. LIGHT, ARCHITECTS



GENERAL VIEW



ENTRANCE PORTICO

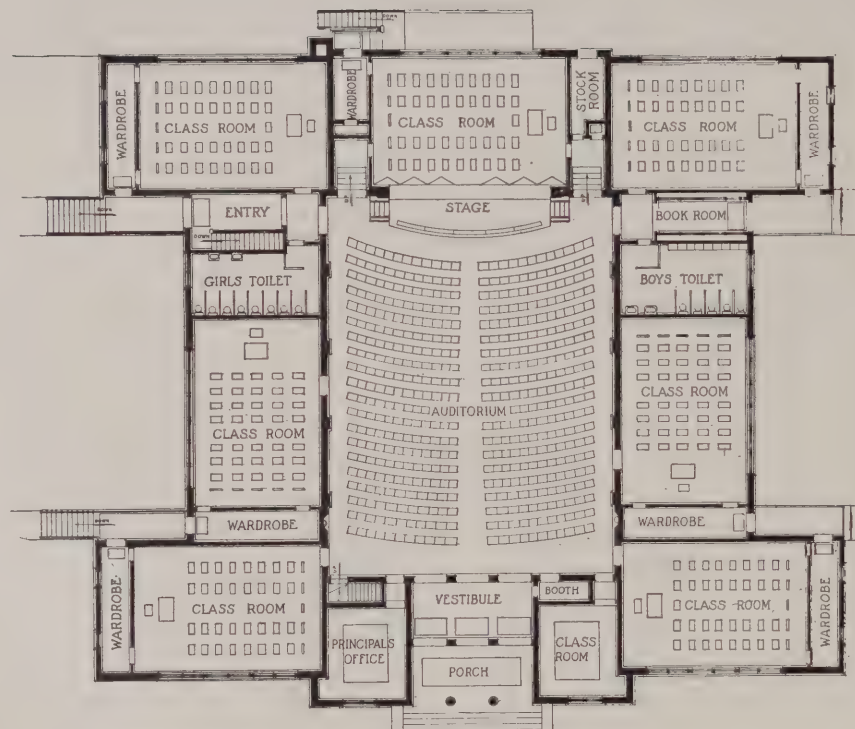
Plan on Back

COMMODORE MACDONOUGH SCHOOL, ST. GEORGES, DEL.
GUILBERT & BETELLE, ARCHITECTS

COST AND CONSTRUCTION DATA

Completed in February, 1924 at a total cost of \$105,198 or 34 cents per cubic foot, this school is designed for 300 pupils, making the cost per pupil \$350.66.

Although not completely fireproof, the building is of slow-burning construction with brick exterior and composition roof.



FIRST FLOOR

PLAN, COMMODORE MACDONOUGH SCHOOL, ST. GEORGES, DEL.

GUILBERT & BETELLE, ARCHITECTS



GENERAL VIEW

Built in the American Colonial style, the beauty of this school building lies in its simplicity, the general proportions, and the classical design of the Doric entrance portico. The treatment of the various roof areas is rather interesting, and the two ventilators surmounting the whole are in harmony with the general proportions of the building. The plan and utility of the layout are frankly expressed by the exterior treatment, there being no attempt to ornament in any way the large unbroken wall spaces occurring on the unlighted sides of the classrooms. The exterior finish is plain brick unornamented in any way except for the entrance, which is of white painted wood, with a graceful wrought iron railing for the steps.

The plan of the building is also very simple, consisting only of six classrooms, two toilets, a teachers' room and the necessary corridors and hall. The heating apparatus is located in the basement. The arrangement of wardrobes in the classrooms seems to be particularly successful.



Photos. Paul J. Weber

MAIN ENTRANCE

Plan on Back

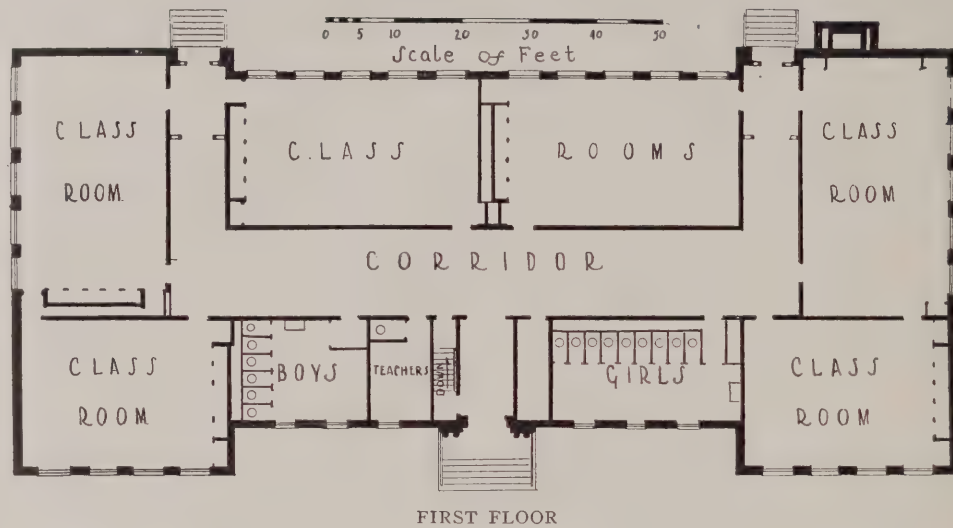
PACKARD STREET SCHOOL, HUDSON, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS

COST AND CONSTRUCTION DATA

Of the bungalow or one-story type, this school was completed in June, 1925, with a capacity of 210 pupils at a cost of \$72,983 or 30.17 cents per cubic foot.

Exterior walls are of brick and hollow tile, and the floors, partitions, and roof are of wood construction.



PLAN, PACKARD STREET SCHOOL, HUDSON, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS



GENERAL VIEW

The principal interest in this bungalow type school, aside from the beauty of the general proportions, is centered in the classical entrance detail, and the graceful cupola which surmounts the roof at the center of the building. The entrance is particularly pleasing, being worked out as a modification of the Doric order in wood painted white, forming a pleasing contrast to the rest of the building which is of plain brick and practically unornamented. The basement course is also of contrasting color, being of white concrete, as are the front entrance steps, which are finished with an iron railing of pleasing design.

In plan the building is also exceedingly simple, being laid out in the form of an "H" and containing merely six classrooms, two toilet rooms and a room for the use of teachers. The boiler room and other mechanical equipment is located in the basement, leaving the entire space on the main floor free for school purposes. In plan and design this building is an admirable example of effective simplicity.



Photos. Paul J. Weber

MAIN ENTRANCE

Plan on Back

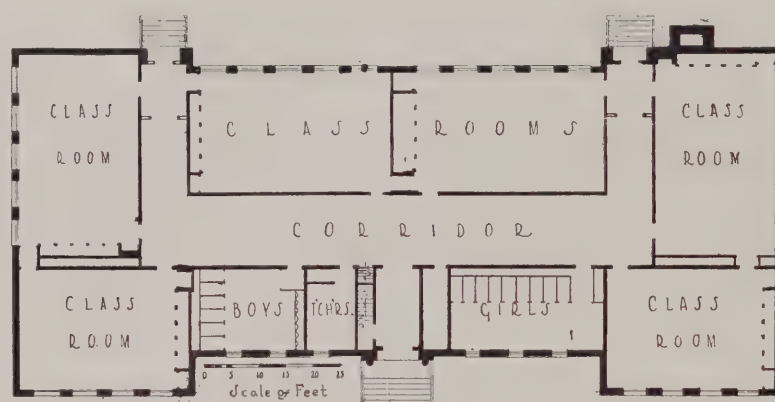
BROAD STREET SCHOOL, HUDSON, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS

COST AND CONSTRUCTION DATA

The total cost of this building, completed in June, 1925, was \$74,346 and the cubic foot cost was 30.69 cents. Each of the six classrooms has a capacity of about 35 pupils, making a total of 210.

The exterior walls are of brick backed up with structural tile. The floors, partitions and roof are of wood construction.



FIRST FLOOR

PLAN, BROAD STREET SCHOOL, HUDSON, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS



VIEW FROM THE COURT



Photos. Gabriel Mowlin

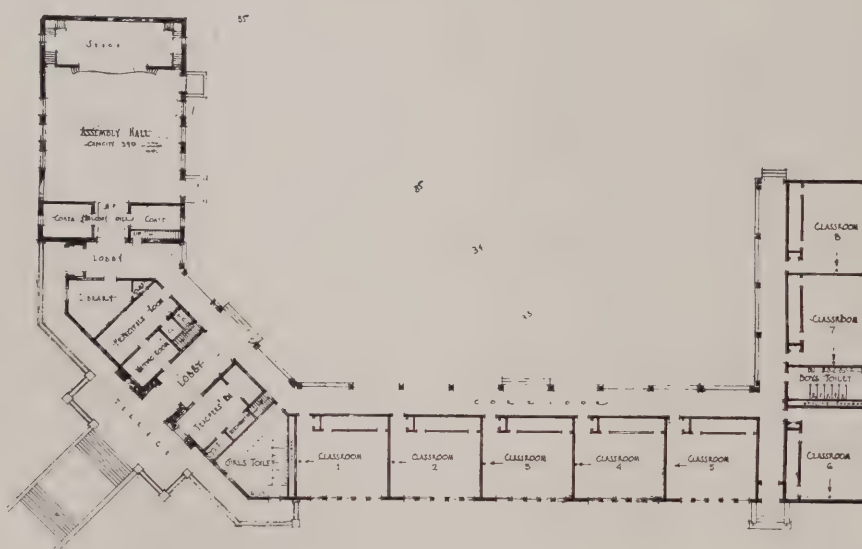
Plan on Back

GENERAL VIEW FROM THE HIGHROAD
CENTRAL GRAMMAR SCHOOL, SAN MATEO, CAL.
JOHN J. DONOVAN & SYLVAIN SCHNAITTACHER, ARCHITECTS

COST AND CONSTRUCTION DATA

Costing approximately \$88,000, this school was built in 1923 with a capacity of 360 pupils. Cost per cubic foot was 25 cents.

The general construction is concrete with an exterior finish of stucco and tile roofs. The floors are of maple, and the interior trim is Douglas fir.



GENERAL PLAN
PLAN, CENTRAL GRAMMAR SCHOOL, SAN MATEO, CAL.
JOHN J. DONOVAN & SYLVAIN SCHNAITTACHER, ARCHITECTS



GENERAL VIEW



Plan on Back

ENTRANCE PORTICO
GRAMMAR SCHOOL, HOLLISTER, CAL.
W. H. WEEKS, ARCHITECT

COST AND CONSTRUCTION DATA

Constructed of pressed brick and artificial stone, with terra cotta tile roof, this one-story school building was completed in 1922 with a capacity of 225 pupils.

The total cost was about \$100,000 or about 26 cents per cubic foot, making the cost per pupil \$444.



GENERAL PLAN

GRAMMAR SCHOOL, HOLLISTER, CAL.

W. H. WEEKS, ARCHITECT



GENERAL VIEW

The simplicity of the Colonial design used here is very pleasing in a school of this type. Being all on one floor and designed for a capacity of 385 students, it necessarily covers considerable area and is laid out with two wings containing classrooms on either side of the central section in which are located the library, assembly room, teachers' and principal's rooms and some classrooms.

The exterior treatment is carried out in plain brick laid at the corners to give the effect of quoins. The main or central entrance consists of a rather plain brick arch with white stone keystone and impost blocks. The side entrances in either wing are somewhat more decorative, being of white woodwork in pleasing Colonial design. All the entrance steps have graceful iron railings.

The building was completed in 1926 and cost \$152,000 or 37.5 cents per cubic foot. This makes the cost per pupil about \$457, without counting the cost of the building's equipment.

*Photos. John Wallace Gillies*

ENTRANCE TO MUSIC ROOM

FRANKLIN SCHOOL, HEMPSTEAD, N. Y.
ERNEST SIBLEY & LAWRENCE C. LICHT, ARCHITECTS

THE ONE-STORY SCHOOLHOUSE

BY
MATLACK PRICE

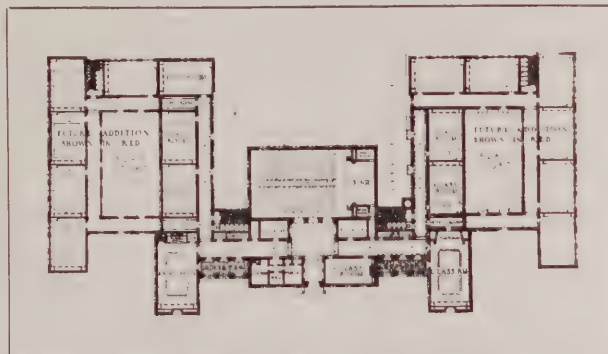
THERE is a growing feeling that the ideal elementary or primary school building for the suburban community is the one-story type, which is not only attractive in itself but attractive likewise in its relation to the residential character of its environment. For this reason, also, it can definitely be said that it adds to the character of a residential neighborhood rather than in any way detracting from it, and its low lines give something of a domestic quality that correlates the school with the home.

Recent school buildings in progressive communities have been designed in general character with the styles suggested by locality or precedent, and architects make every effort to create stylistic harmony throughout the entire school system of the community. The one-story primary school, thus, is designed as a building related to the larger school buildings, and a pleasing consistency is the result. This harmony in design has been carried out with excellent effect at Hempstead, New York, where the high school is a monumental building of Georgian Colonial design, and the Franklin and Fulton primary schools are of the one-story type, adapting the same stylistic manner. Generous shelters have been provided for these two buildings, giving ample protection to the pupils who arrive early and furnishing a play space for use in bad weather. Certain conditions which are part of the daily routine of the primary school have led architects to give their best attention to meeting these conditions with definitely intentioned

plan features. Since play and physical training are essential parts of modern school procedure, even for very small children, the large corridor or lobby in front of the assembly room is an important element in the plan. And in the assembly room itself, which has an average seating capacity of 450, half the floor space is left open for play and for physical exercises. The portion provided with seats is designed to accommodate class groups in assembly.

School boards have found that definite advantages are secured through professional architectural guidance in this, as in any other school project, and that the architect can and will be glad to assist with the landscaping problem, and with such details as furniture, draperies and equipment, all of which should harmonize in character and color with the entire scheme. The details may seem unimportant, and yet if they are neglected or poorly done much of the result of the architect's skill and labor may be lost, or at least rendered far less effective than might otherwise be the case. The necessity for practicing economy is ever present with boards of education, and on this account they often hesitate to employ the

architect's services on these supposedly unimportant details of the work. Any architect, however, who desires the complete and ultimate success of his building, is entitled to render such service, and would rather do so than discover, at the end, that the setting for the building or its furniture and its other equipment do not faithfully carry out his orig-



Main Floor Plan



Elementary School No. 4, Bergenfield, N. J.
Ernest Sibley and Lawrence C. Licht, Architects



Library, Elementary School No. 4, Bergenfield, N. J.

inal conception of the finished scheme. Among other features provided by the architect who equips as well as designs the school building are ventilated wardrobes at the rears of the classrooms, the doors of which open and close together. Above the blackboards are exhibition boards, covered with soft-toned burlap and planned to provide generous exhibition space. The music room is provided with a stage, with an entrance from the corridor, and this room proves a valuable adjunct to the school for classes in visual instructions, civics, theatricals and for Mothers' and Parent-Teachers' meetings.

A little specific information is more valuable than quantities of generalities, and architects and school boards alike will probably find considerable definite suggestion in the notes on a few primary school

buildings illustrated in connection with this number.

Plate 80 illustrates the Franklin School. If it were possible to cite the source which inspired the design of this building, as well as some others also presented here, the old Colonial mansions and homesteads of Maryland and Virginia would come nearest to supplying the answer. Three characteristic features have been retained,—the main center building, its two end wings, and their connection by means of open shelters, as at Mt. Vernon. Only sufficient basement space was allowed to accommodate the oil burners, so that the building is but three steps above the ground. A large kindergarten provides work and play space for kindergarten and first grade children, and the music and visual instruction room, and the library, with book shelves and fireplace, are delight-



Music Room, Elementary School No. 4



Kindergarten, Elementary School No. 4

Ernest Sibley and Lawrence C. Licht, Architects



Library, Junior High School No. 3, Trenton, N. J.

ful innovations in this modern primary school. Little chairs and tables of Colonial design, a miniature piano, attractive hangings and accessories everywhere greet the eye, and so completely is the spirit of childhood expressed throughout that one experiences a feeling of surprise when an adult enters the picture. The building is planned for future extension, with possibly a two-story wing in the rear, if the growth of the community demands it, thus forming across the court a background for the beautiful, homelike facade of the little children's schoolhouse. The school just described cost, in the metropolitan district, about \$130,000, which is probably 20 per cent or 30 per cent more than it would cost in the middle west and south. It is of fire-proof construction, excepting the roof timbers, and

has face brick on all sides. Due to the saving in heavy construction, floor slabs and the other structural necessities of larger buildings, the cost per pupil for similar construction is appreciably lower than in buildings of two or three stories.

Elementary School No. 4 at Bergenfield, New Jersey, is a building of a type similar to that just described. It was recently completed, and is planned, due to its site, for a different scheme of enlargement. Its unusual charm is evident in the accompanying reproduction of a water color drawing, but for a more adequate impression photographs (not yet available) of the finished building are essential. This school has been built at a cost of about \$152,000.

The Massapequa School. The variety of plan and design possible in schools of this same size and type,



Kindergarten Wardrobes, Elementary School No. 4



End of Library, Orange High School, Orange, N. J.

Ernest Sibley and Lawrence C. Licht, Architects

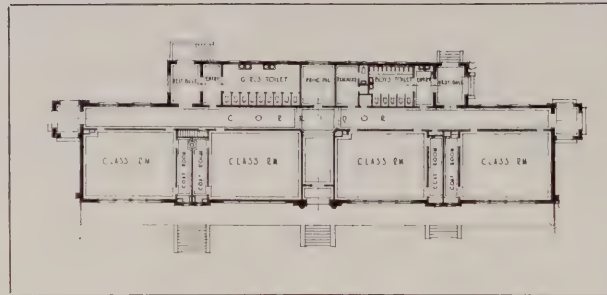


Grant Open Air Elementary School, San Diego

and serving the same general purpose of housing the primary grades, is indicated by the unusually quaint building, with its unique plan, developed for Massapequa, New York. (Plate 74.)

School for School District No. 1 and Owen D. Young, Van Hornesville, New York. When the village school at Van Hornesville, New York burned to the ground last year, Owen D. Young saw his opportunity to give to the school children of his home town a building that would give them more complete educational opportunities than are usually provided in a rural community. His love and appreciation of all that is native to Van Hornesville and its vicinity caused Mr. Young to decide not to import anything necessary to the building of the new school,—excepting his architects. Securing the choice of all the available building sites, he proceeded to engage local workmen exclusively, and one of the most interesting facts about the entire project has been that the youngest skilled workman on the work was 67 years of age and the oldest 83. They are master craftsmen of the old kind,—a type rapidly vanishing. Old walls dividing the Young, Van Horne and other nearby farms furnished the stone for the walls of the building, and these, when split ready to be laid, revealed a wonderful variety of sparkling color effects in red, black, lavender, rust and gray.

In addition to two regular classrooms which can be thrown together for community purposes, the building provides rooms for manual training, domestic science, teachers' room, and a library, which will also be the library for the village. Nor does the ultimate plan stop here, for it has been laid out with



Main Floor Plan

Grant Open Air Elementary School, San Diego
T. C. Kistner & Co., Architects

a view to indefinite enlargement, by a group scheme, and eventually it may comprise a district high school. The rooms at the rear of the building overlook a large playground, seen across the picturesque Otsquaga Creek, which is crossed by rustic bridges, which are a part of the landscaping scheme. It is an appropriately simple

scheme, planned by Mortimer Merritt, landscape architect, and will provide a setting for the building which will form altogether a delightful picture. As the ground at the rear slopes rapidly away toward the bank of the creek, this natural grade allows for an entrance under the classrooms, and for a spacious room for the storage of playground apparatus during the long winter. Beautiful floors and woodwork are being put in place, and the building is equipped with the best and most modern of plumbing, heating and electrical systems, special provision being made so that all developments in radio, vitaphone and television may be enjoyed within the building. The furniture, which is to reproduce early American forms, is being made by a few veteran craftsmen.

The present building overlooks the main highway between Cooperstown and Fort Plain, and has already attracted wide attention, not only on account of its beauty and the surprise of finding it in so small and unpretentious a community, but because the donor, Mr. Young, is a figure of national and international prominence. Born in the hills overlooking the village which his ancestors settled generations ago, Mr. Young now maintains his most frequented residence, "By the Side of the Road," in the village of Van Hornesville, which he has beautified.

THE PRIVATE SCHOOL

BY

CHARLES G. LORING, ARCHITECT

THE characteristic flavor of a private school may be derived from advanced educational theories or from the acute social desires of its organizers and clientele. These surprisingly diverse motives, even when they occur simultaneously, can be easily reconciled by the architect. An out-and-out educator looks upon the institution as an opportunity for research, for the introduction of new and better methods of developing the minds and characters of the young. The worldly-wise parent looks upon the private school as the matter-of-course means for the selection of the fittest human environment. Unlike as they are, the earnest believers in these two creeds have one common denominator,—the avoidance of mass production.

In designing public school houses, the architect is cribbed, cabined and confined. The building committee has only limited funds; the new structure must not cost more than so many cents per cubic foot, nor more than so many dollars per pupil. For economy in teaching force, the classrooms must hold the determined maximum which one teacher can put through the daily mill. Regulations prescribe the minimum breadth of corridors, the minimum number of toilet fixtures, the minimum area of windows, the minimum width of treads, and seldom are these basic limits exceeded. The inspiring challenge to the imaginative designer, after the skill and common sense of the planner and the builder in him have done their utmost, is to clothe the factory of education with a dignity and graciousness which will in some measure stimulate the pupils and their

teachers and enhance the beauty of the community.

Private school buildings are the products of successful business ventures or the remorseless extraction of "loans" from parents, or of fine, fat endowment funds. Occasionally, when the wherewithal is not adequate for a permanent plant, an old house is remodeled or a frankly temporary and experimental structure is evolved. The latter is often somewhat akin to the small, one-teacher schools in the country or the "portable bungalows," the overflow make-shifts in congested cities. The Shady Hill group, designed by S. W. Mead, was built on a strictly limited budget and on the assumption that wooden roofs and walls of clapboards lined with plasterboard would last till new generations of parents had rolled up a fund for a more permanent type of construction. There are nine buildings in the little village, all one story in height. Four house the assembly hall with administrative offices and show rooms, the laboratory, the studio and the carpentry shop; the other five units each contain two classrooms, each with a supplementary small workroom connected by glazed double doors, and two toilet rooms. The classrooms have one long side to the south and one end with continuous windows so glazed that they may be completely opened, and additional windows on the north. The rooms have sufficient depth to allow the movable desks and chairs to be pushed back out of the direct sun. Simplicity, freedom, quiet and fresh air were the key words in the coöperative venture, jointly developed by parents, teachers and architect.

In private schools the classrooms have fewer



Photo. Arthur Cushman Haskell

Building at Phillips Academy, Andover, Mass.

Guy Lowell, Architect



Photo. Paul J. Weber

New Group of Buildings at Phillips Academy, Exeter, N. H.

Cram & Ferguson, Architects

pupils than in the public schools,— often no more than 20 for the upper grades and 15 for the lower, in place of the usual 35 or 42, but the rooms themselves may be no smaller. In fact for the younger pupils there is often a clear space left near the desk for group work, and for the older pupils for conferences and seminars. In municipal schools a fireplace is not considered a luxury in the kindergartens, and this attractive (and hygienic) feature is carried into the upper grade rooms in many private academies to relieve the austerities of blackboards and desks. Open-air classrooms, or at least classrooms which can be opened up on two or three sides, are sometimes introduced, though this feature is not in such vogue as formerly, the eccentricities of American winter climate tending to restrict their use. The introduction on a commercial basis of window glass which allows the passage of the sun's ultra-violet rays has appropriated for the average schoolroom one of the advantages of the open-air type. The rest room for day pupils is a definite feature, and it may sometimes be in the form of a loggia and sometimes as an adjunct to the lunch room.

In some states and localities the boards and inspectors who try to teach the teachers how to plan to the best advantage for the health of the pupils prescribe rules for ventilation, circulation and fenestration. Massachusetts, for instance, calls for windows with one-fifth the classroom floor area, two means of egress from each room, and fan ventilation. New Hampshire in her public schools allows window ventilation, but is dead set against windows placed behind the teacher and so shining in the faces of the pupils. Some other states don't meddle, and the architect who is more preoccupied with the design for a monumental or picturesque facade may cut down the window openings. A most romantic boarding school in Connecticut has as few and as small windows as a Surrey farm group, but the class-

rooms and sleeping quarters must pine in vain for a flood of good, outdoor light! Eye strain and murky interiors have more effect on the body and mind of both pupil and teacher than may be atoned for by the most fascinating craftsmanship and stage setting of the exterior of the school buildings. Indulging a beautiful fad is not a progressive step in education.

Much is demanded in the way of auxiliary units in a private school. Grade for grade, the rooms for drawing and for domestic arts, for manual training and for science, above all for luncheon and for recreation, are usually more cheery and more ample, while the library invites contemplation and browsing rather than suggesting only organized group research and the pursuit of original sources. Such effects are not due to the expenditure of more money on decoration than in the typical public school but frequently to the larger ground area, fewer stories and more rambling plan of the private academy and the avoidance of standardized floor heights. Commercial rooms are notably absent, but music cubicles take their places. Perhaps this summarizes the obvious differences between the expenditure of tax payers' money and the expenditure of donations. In the boarding school or the modern day school where the pupils spend the afternoon, the playrooms and the playgrounds are of particular importance. Yacht model building, printing the school paper, costume designing, wireless experimentation and general tinkering with mechanical gadgets or the crafts of enameling and metal work are all introduced as indoor sports, with the educational features well disguised in the fun of the thing. And whether for boys or girls, there must be space for these pursuits.

The Roxbury Latin School, designed by Perry, Shaw & Hepburn, is an excellent example of the suburban private school of the "country day" type. The grounds are ample to screen the building from the neighborhood and are well planted with trees and



Winsor School, Longwood, Boston
Office of R. Clipston Sturgis, Architects

shrubs and there are playgrounds for organized and for informal sports. Although there is a separate house for the masters, there are no "boarding" pupils and no need for non-scholastic buildings such as dormitories, an infirmary, or a chapel,—departments the planning of which is not specifically identified with schoolhouse design. The original program emphasized a desire for a friendly personality, even requiring fireplaces in all the classrooms, and the building has struck this note admirably. The plan is rambling and this allows a definite coordination into four departments: (1) administration, (2) academic, (3) lunch room wing, and (4) auditorium wing. This further allowed part or all of the building to be constructed at one time. The classrooms have all the same orientation, and their bay windows give to the rooms a sunny informality and to the exterior a charming individuality. The typical classrooms are about $29\frac{1}{2}$ feet in length by $24\frac{1}{2}$ feet wide and are intended for 25 pupils each. The clock tower not only suggests the time-honored tradition of the bell but serves as a semi-isolated stair well and as a centralized location for the ventilating fans. The Georgian style is closely enough allied to the early traditions of the state, and in its free use there are avoided many of the restrictions of Colonial.

One of the minor skirmishes still unsettled between warring groups of pedagogues on the public payrolls concerns the storage and supervision of pupils' outer wraps. Except in the kindergarten and the one-room school, the coat room, *per se*, has gone down in defeat, its floor area being too large and its visibility too low. For the lower grades, the wardrobe built into the classroom wall, with group doors, has the greater number of followers, for it is inexpensive, easy of control and may be well ventilated. For the upper grades, where the classes circulate from room to room, often subdividing and then coalescing again, the "home room" unit is not prac-

tical, and the majority of experts favor individual steel lockers, built into the main corridors or grouped in alcoves. On one thing both sides agree:—there must be supervision or security. Not so in the private school, at least in the smaller type; there, wardrobes may be ranged unlocked along the corridor walls, for the idea is to inculcate honesty. In quantity production this is a far more difficult undertaking! In plants which do not have separate locker buildings, the parking space for outside wraps must be generously supplemented by locker rooms, convenient to the gymnasium and to the athletic fields.

The assembly hall and the playroom or gymnasium (the name suits the ages of the pupils) vary in their mutations, but they may be grouped in three classifications: (1) Separate; where the expense is great, but the problem simple. (2) Combined in one; a none too satisfactory compromise and requiring much chair storage space and janitor service. (3) Articulated; that is with the two back to back, separated by folding partitions or heavy curtains, where, in theory, the auditorium seats may be used for spectators of games in the gym and where the gymnasium may be used to enlarge the stage enormously. The separate units are to be preferred, if the size of the school and the need for organized, competitive games justify the expense. After all, the treatment of an auditorium for proper acoustics and suitable decorations is incompatible with washable and rough-usage gymnasium walls and ceilings. A stage suitable for music and theatricals is a poor background for a basket ball goal, and the moving of chairs from storage, setting them up and then replacing them, is not a task which will be lightly undertaken for one evening's entertainment or one morning's address by the headmaster. The "articulated" hall and gym (each profession has its own trick vocabulary) was highly favored in the larger high schools a few years ago, but it has not been



Photo. Paul J. Weber

The Beaver School, Boston
Charles G. Loring, Architect

Photo. Peyer & Patzig

Buckley School for Boys, New York
Simpson & Rolston, Inc., Architects

introduced into the private schools where those with heavy enrollments have land enough and money enough to build separate structures for their athletics and for their assemblies. In some of the smaller boarding schools and in some of the larger day schools the auditoriums are adapted to religious services. In all cases it is well to have the hall so located that it is easily accessible to the pupils for general assemblies or class work and yet with independent doorways so that it may be used without interference with the rest of the plant.

The boarding school group of many buildings, set on the open hillside, or the suburban country day school, with its trees and grassy playgrounds, pictures the private academy at its best and overshadows the rural and small town public schools; but when the pay-as-you-enter institutions of learning come within the congested city limits, their personalities fade; land values restrict their facilities, and the teeming municipal high schools make a far grander show and often are better equipped. Playgrounds are driven to the roof, libraries and lunch rooms are cramped, and even the classrooms sometimes have a much smaller area of floor per pupil. The corner lot is much to be desired, and R. Clipston Sturgis' Brimmer School, with streets on three sides, presents an interpretation which is at once dignified, practical, expressive of its purpose, and economical.

Standardization of the rubber stamp ideal is out of the question in the designing of private schools. In size they may range from the kindergarten of

one or two rooms to the long established boarding schools with collegiate plants including guest houses for visiting parents and fraternity houses for the boys. The theory of pedagogy on which they are based may lean toward "the development of the individual" and have no two classrooms shaped or decorated alike, or toward "the development of character" and have a military academy in gaunt barracks. The administration in one school will have all the teaching done in "home rooms" supplemented by a few laboratories and special units; another will have large "study rooms" with many small recitation rooms as well as the auxiliary units. And with the exterior treatment the funds and the fancies of the building committee are the only outside limitations on the architect. The Colonial style is a prime favorite in New England, where education has become almost a major industry, and in Virginia, where children are sent for a modified winter climate and a taste of Southern traditions. The Gothic, especially the domesticated British version, is popular with ecclesiastical schools, and its flexibility in fenestration is a great advantage. In Florida and California the Spanish is the correct thing, and in New Mexico some schools have been constructed after the old pueblos, truly American. With such freedom of action before him, the architect need only coördinate minds of educators, vision of parents, and inarticulate reactions of children with his own technical business and artistic experience in order to undertake the designing of a private schoolhouse!

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Published Monthly by

ROGERS & MANSON COMPANY

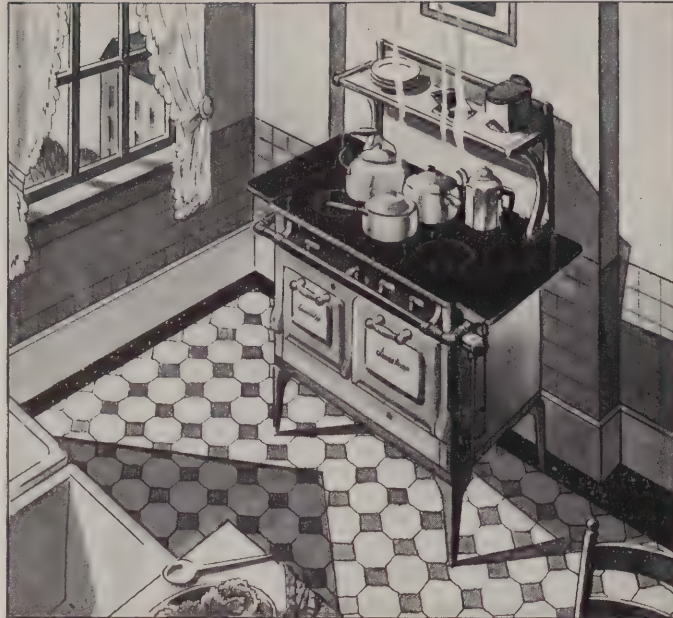
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BOOK DEPARTMENT

A WORK ON STRESSES, GRAPHICAL STATICS AND MASONRY

Reviewed by FRANK W. SKINNER, CONSULTING ENGINEER

WHEN the seniors of today were students in schools or colleges, wooden beams, girders, columns and trusses were being displaced by wrought iron; the requirements for framed structures were usually vague and arbitrary, the strength and other properties of the materials used were not well or widely determined, and methods of analysis and computation of stresses were crude and inadequate. In the early days of some of our leading technical colleges, instruction in calculation and design of structures was largely derived from the applied mechanics of Rankins and Weisbach and the analytical and graphic methods of Greene and Wood for computing truss stresses, supplemented by the interpretations and extensions of some notably brilliant lecturers in classrooms. The student learned, maybe, to calculate the stresses in a few simple types of structures, under more or less accurate assumptions, and attempted to take out an insurance policy for ignorance by the use of a "factor of safety," large enough to cover uncertainties, mistakes, and "acts of God." Now, the analysis of structures and computation of stresses are a highly perfected art, with a multitude of writers and teachers producing numerous papers and textbooks, some of high value,—and some conflicting,—that not only cover a wide field with elaborate data, but by their volume and variety appall the student and the ordinary practitioner. A great service has therefore been rendered to architects, engineers, and other designers and students, in the preparation by Dr. Swain of this complete, up-to-date, authoritative description and analysis of structural stresses, with clear and simple demonstration of the best and the most accurate methods for their rapid, practical determination by analytical and graphical methods that verify each other.

By also discussing the theory and design of masonry structures, giving the fundamental principles and methods of their application in equally convenient and comprehensive manner, the author has so practically covered the two great classes of steel and masonry that are the first essentials in nearly all important structures, that the competent designer may safely adopt his methods, formulæ, and supplementary data with great economy of time and labor, and assurance of accuracy and compliance with high standards. This book deals with stresses developed in structures of wood, metal and stone, chiefly buildings, bridges, sub-structures, and their elements, that are subjected to stress in tension, compression, flexure, and torsion; and defines and studies the dead and live loads and their reactions that constitute the outer forces which produce the inner forces of stresses that are analyzed and calculated. Valuable data are given of the amounts, character, application and effects of various kinds of loads, including snow, wind, crowds, trains, vehicles, merchandise, earth pressure, liquid pressure, etc.

In Chapter X, Dr. Swain places the first use of the truss idea in about the year 1560, and sketches the development of the principal types of trusses up to date. He devotes five chapters to stresses in trusses, the analytical method of joints, and the methods of moments,

with abundance of diagrams, formulæ, explanations and examples. The chapter on economics of simple trusses considers the most advantageous determination of various requirements besides the bare consideration of minimum weight. Several of the book's chapters are devoted to graphical statics, their general principles, and the determination by them of reactions, moments, shears, centers of gravity, moment of inertia, and of stresses by the methods of moments and of joints. The chapters on dimensioning and impact give the most advanced methods, standards, theories and observations, contain extracts from specifications, and give data of great practical value, derived from tests, experiments and investigations, including the impact percentages found in working structures, and the velocity of transmission of stress in materials. The treatment of these subjects is well considered.

The nine chapters covering earth pressure, masonry, retaining walls, piers, arches and dams, give extended consideration to the cohesion of earth, friction, angle of repose, surcharge, comparison of theories, hydrostatic and hydraulic pressures, experiments, masonry types, repose, specifications, rules and principles of design, stresses, strength and stability, and detail and design of retaining walls, loads, shape and dimensions of piers and abutments, theory of loads, stresses, design, types and details of hinged and hingeless arches, linear arches, and concrete arches. Dams are considered as substantially straight or curved retaining walls, holding back water instead of earth. Vertical, horizontal, and inclined pressures, uplift, cross section, stresses and stability, foundations, spillways and expansion are considered; diagrams, formulæ, and notable examples of important structures are given. The remarkable clearness, attractive presentation, logical treatment, and the combination of mathematical and scientific accuracy, with practical considerations that characterize the entire book, are the natural expression of Dr. Swain's notable experience and services as a distinguished educator and eminent practicing engineer of many years' prominence as Gordon McKay Professor of Civil Engineering, Harvard University; Chairman, Boston Transit Commission; Consulting Engineer, Massachusetts Railroad Commission; Past President American Society Civil Engineers; member of many technical, scientific and engineering societies; consulting engineer, and author of many papers and monographs.

The book is equally valuable for reference, for study, and as a working tool. It is at once a handbook, a summary, and a very complete treatise that reduces difficult and complicated problems to their lowest terms, and solves them by the obvious application of simple rules and principles without complex operations, tedious calculations, or intricate mathematics. It should find a place in every technical school and library, and be indispensable for every structural designer as well as to many architects.

STRESSES, GRAPHICAL STATICS AND MASONRY. By George F. Swain, L.L.D. Professor of Civil Engineering at Harvard University. 525 pages, 6x9 ins. Illustrated. Price \$5. McGraw-Hill Book Co., 370 Seventh Avenue, New York.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

THE A. B. C. OF PLASTERING. By A. H. Telling. 235 pp., 5 x 7½ ins. Price \$3.25. Oxford University Press, New York.

ONE of the consequences of the present high costs of construction seems to be careful study into use of materials and methods of building in order to secure whatever may be had in the way of economy in using materials and the best possible results when a building has been completed. Thus different aspects of carpentry, wiring for electricity, and the installation of plumbing, heating and ventilating equipment have been dealt with, and numerous manuals are being published for the guidance of artisans and for the information of architects and their specification writers. The present volume deals with plastering, discussing its history as well as its practical use. While written from an English point of view and making use of terms which are no doubt different from those used in America, the work supplies a most excellent manual for the use of plasterers anywhere.

CIVIL ENGINEERING SPECIFICATIONS AND QUANTITIES. By G. S. Coleman and G. M. Flood, 282 pp., 5½ x 8½ ins. Price \$4. Longmans, Green & Co., Ltd. New York.

DURING the past year the presses of many large publishers have been producing volumes dealing with engineering in one or another of its phases, with materials and their use, and with other subjects which to engineers and builders are interesting details of theory or practice. These works are of value not only to established engineers, who desire to keep abreast of the latest, but also the large number of engineers who each year leave academic halls for practice in the field.

This particular work, by two widely known English engineers, deals with its subject from what is naturally an English point of view, and it might be regarded, in a sense, as setting forth the very fundamental elements of professional practice. It deals with the duties and responsibilities of a civil engineer to his clients and to the public in general; with his relations to contractors; with countless matters in regard to contracts and the methods of dealing with the municipal boards or authorities with which civil engineers generally have to do. Then it takes up the choosing of materials, their use, and the matter of the workmanship which is required for the proper use of materials, and then the highly important matter of preparing adequate specifications for the economical obtaining of just what is required; and finally the estimating of the quantities of material which will be needed, and their costs, which logically have much to do with the matter of obtaining cost estimates. The broad scope of the work and the excellence and clarity of its presentation give it a highly practical value to engineers and architects.

WOOD AND LUMBER. By Adnah Clifton Newell. 211 pp., 6 x 9 ins. Price \$2.25. Manual Arts Press, Peoria, Ill.

IT is doubtful if the use of any of even the most adaptable building materials will ever equal in extent the use of wood. Wood enters and always has entered into the construction of buildings of every conceivable kind, and it is not likely that anything else will ever be found to take its place. The wide use of wood naturally gives importance to consideration of its qualities, and study of

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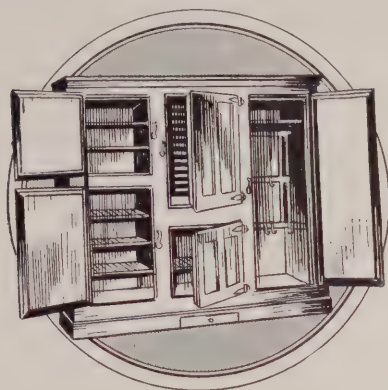
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wood's qualities or characteristics forms the subject matter of this volume, one of the useful works of a more or less technical nature being published by the Manual Arts Press. The author, who is Director of Manual Arts at the Illinois State Normal University, considers the nature and characteristics of woods of different kinds, their growth and composition, matters which have to do with their strength, liability to shrinking, swelling, warping, durability, decay, etc., and part of the volume is devoted to the important matter of wood preservation. The latter chapters are devoted to consideration of lumber; the term used apparently when the wood of a tree has been made ready for marketing and use. These chapters deal with "Lumber Classification and Grading," "Lumber Manufacture," and "Sizes of Lumber," fully and adequately.

CONSTRUCTION DETAILS SHOWING MODERN APPROVED PRACTICE. 160 pp., 9 x 12 ins. Price \$1. *Building Age and National Builder*, New York.

CERTAIN individuals fully familiar with developments in the building field report that with the slipshod methods by which workmen construct a large part of the building which is being done today there is danger of the trades' losing that strong grasp upon their work which in all ages of our history has characterized the American workman,—a knowledge which has always been a cause for honest pride. The danger, it is further pointed out, is all the greater in that the trade or "vocational" schools, the function of which is to train mechanics or workmen for the different building trades, may find themselves obliged to train men to work not according to traditional standards but to the far less

admirable standards maintained by present-day contractors and sub-contractors, the inference being that workmen not so trained may find themselves handicapped when they begin actual work. And yet, as is well known, these trade schools are responsible for training a great part,—possibly greater part,—of the men who must maintain and carry on the traditions of American building. The failure of the schools, by lowering their standard, will mean logically the destruction of the traditions behind the different trades. This valuable work, prepared by the editorial staff of *The Building Age and National Builder*, is intended for the guidance of carpenters, architects, draftsmen, detailers, contractors and others concerned in building construction.

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STANDARD CONSTRUCTION METHODS. By G. Underwood. 407 pp., 6 x 9 ins. Price \$5. McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

THERE would seem to be no lack of recent works dealing with construction in its many and varied phases, the intention of their authors being no doubt to supplement the training which the workman receives in his trade school and to constitute a kind of encyclopædia or guide to standard practice to which the workman or the superintendent of building may refer. This particular volume, the work of a well known construction engineer, is one of the fruits of considerable experience and much observation. Primarily the book is intended for the use of construction superintendents and others upon whom the responsibility of getting things done may rest. It covers a wide field, as is essential if it is to be useful to men who are expected to have a wide general knowledge of construction work.

"The author has endeavored to make simplicity and preciseness the outstanding characteristics of the book. He has adhered to simple principles and has described only such methods as he has found to be the most useful

in the ordinary run of work. Descriptions of 'stunts' and unusual methods have been carefully avoided. In planning the book, each subject has been visualized from the standpoint of a construction superintendent, and the usual and most up-to-date way of doing the work has been described. Sufficient other information has been given in each chapter to make clear the science of the subject. The different classes of work have been arranged in chapters following one another in accordance with the sequence of operations usually followed in construction projects, describing all the steps necessary to carry on a project from excavation to painting. The introductory chapter suggests the organization of the construction force and the layout of the plant and describes the various pieces and types of equipment used on an up-to-date construction project. The first step in the operation being excavation, this is discussed including layout, retaining measures, blasting, water control, and pile driving. Following this, the major portion of the book deals with structural operations divided according to the kind of materials used,—that is concrete, brick and steel construction, describing in some detail each of these materials and the operations and equipment used in assembling them. In the chapters on "Roofs and Flashing," the author seems to have confined himself almost entirely to the application of various kinds of built-up or composition roofing on flat roofs. The interior finish of buildings is then discussed under the heading of "Lathing and Plastering." Following this more detailed information is given on the subject of equipment in a chapter on "Scaffolds," their planning and erection.

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THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER THREE

MARCH 1928



THE CONSTRUCTION OF SCHOOL BUILDINGS

BY

C. B. J. SNYDER

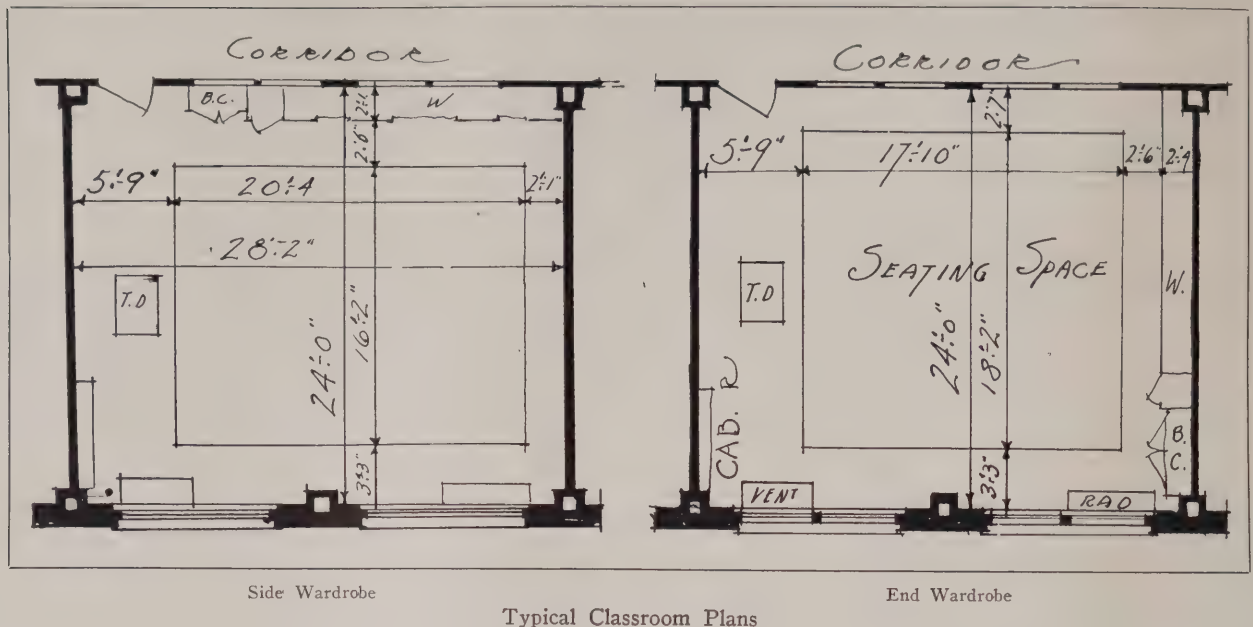
FORMER SCHOOL ARCHITECT FOR NEW YORK

ALTHOUGH all school buildings are intended for the same general use, they present an unusually wide range of construction problems. They vary in size from one to almost 200 rooms, and in height from one story to ten or more. These differences in size are entirely physical, but the character of the scholastic curriculum has an important influence on the construction of a school building. The curriculum usually includes a wide range of subjects, many of which require specific accommodations. The development of and changes in curricula are continuous and sometimes of a decidedly radical nature, and to attempt to envisage their future nature and requirements would be impossible. To provide for new and often radically changed needs requires construction that has a certain measure of flexibility. The correct limitation of materials permits easy and economical alterations and changes in the structure and plans. The architect must consider the possibilities of the site; the required pupil capacity; the amount of money available; the scope and nature of the curriculum; the probability of the necessity of enlarging the building to accommodate an increased pupil population; the probability of there being new and specific requirements for future developments in teaching methods and additions to the curriculum. More remotely, the architect has to consider also the possibility of there being a radical change in the character of the population of the surrounding territory; the intelligence and the ability of the superintendent of schools and the board of education; and public opinion. The factors involved render the designing of a school building a most complex problem.

The operation of a public school might be likened to a production process. The school building should be planned in essentially the same manner as an office or loft building. Suitable facilities for safe entrance and exit of the occupants are essential. In addition, sufficient means of circulation through corridors and stairways is also necessary. With these essentials provided for the safety and convenience of the pupils, the remaining working space should be laid out in such a manner that it can be subdivided to suit general and special requirements as they arise.

Types of Construction. The usual types of construction, from a structural standpoint, used in building schools are the wall-bearing type and the skeleton-frame type. The former usually has brick outside walls and brick bearing walls for the corridors. The floor and roof construction may be of wood, either simple frame or heavier "mill" construction; or light steel or the newer steel trussed joists may be used, fireproofed or not. There are many variations and combinations possible, such as the use of steel beams to support the shorter floor joists, etc. Fireproof construction is not usual in a wall-bearing type of building. Some of the materials may be incombustible or some slow-burning, but fireproof buildings are today practically all of the skeleton-frame type.

Wood and "Mill" Construction. School houses to accommodate a small number of pupils can be very satisfactory when built of wood or standard mill construction, in connection with brick exterior walls and corridor partitions. They can be made entirely safe with certain obvious precautions. The element of fire protection is one of the most important in schoolhouse planning, allied to which is the necessity of providing sufficient means for circulation and egress in case of possible panic conditions among the pupils. Panics may be caused by means other than fire, and if sufficient circulation and exit facilities are provided, fire protection can be safely limited to the construction of fireproof boiler or furnace rooms and the insulation of heating or ventilating ducts and steam pipes. There is little cause for fire hazard in a school building except in these items and in the accumulation of rubbish in basement rooms or closets. Although the wood stud partitions are generally and usually quite rightfully considered a fire hazard, they can be so fire-stopped that with metal lath and plaster they are fire-resistive to a high degree. It is feasible in this type of building to construct fire partitions of hollow tile, made either of clay or gypsum, or solid metal lath and plaster. The only other problems in connection with a mill-constructed school building would be the soundproofing of the floors so that the noise of moving pupils would



not be transmitted from one story to another. It is not likely, however, that buildings of this type would be more than two stories high. There could be no question whatever about the safety of such buildings if they were equipped with automatic sprinklers.

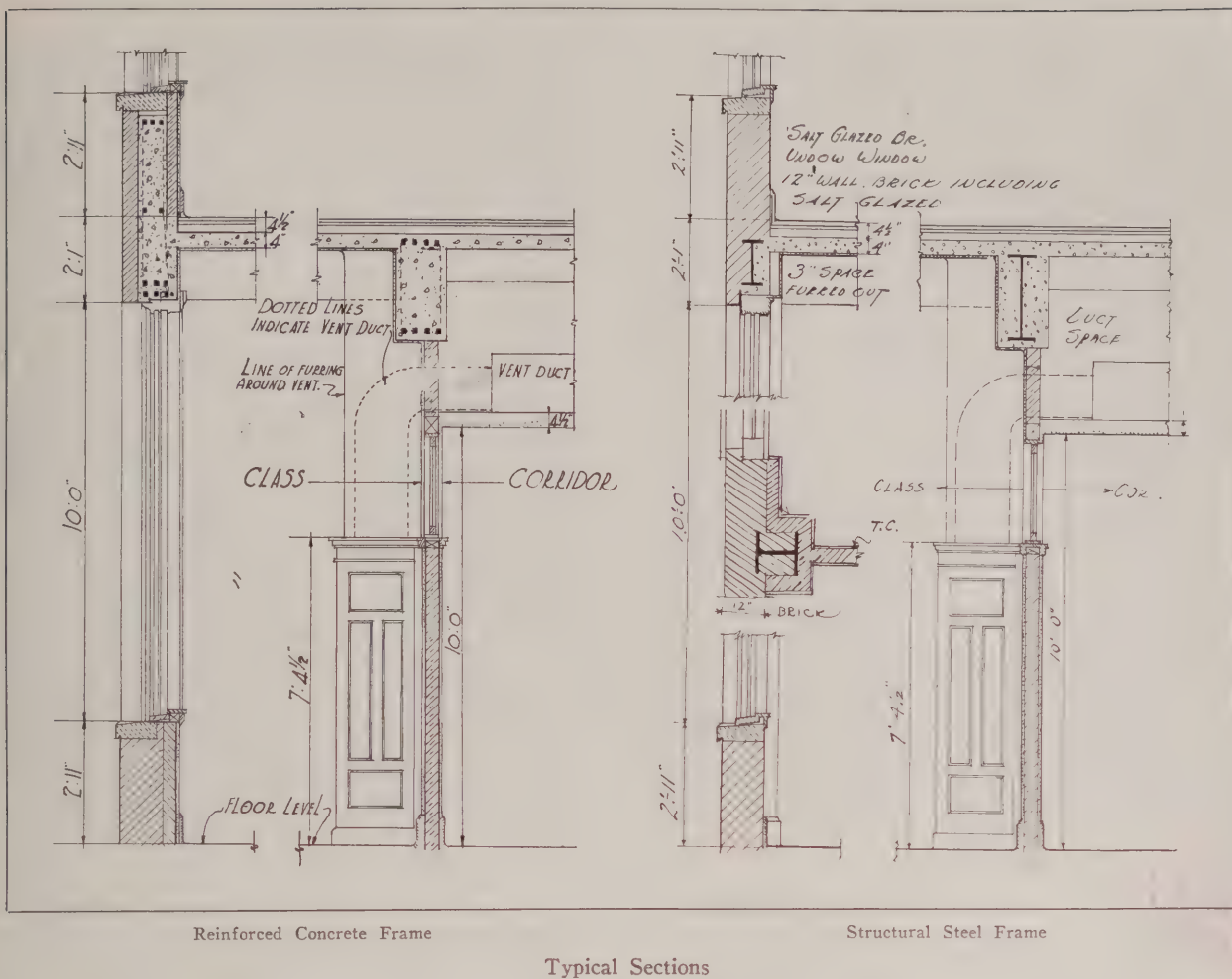
For the light floor loads common to school buildings, a form of steel construction which consists of light steel trussed or bar joists or pressed steel joists has been found very satisfactory. These are placed approximately 2 feet apart, and on them is laid a thin concrete floor slab with such a finished surface as is desired. The ceiling is usually constructed of metal lath and plaster or a gypsum slab.

Skeleton Frame Construction. Larger school houses are quite commonly built with skeleton frames. These frames are either constructed of structural steel or of reinforced concrete. Hollow tile arches or reinforced concrete slabs are used for floor construction. The type of construction selected is influenced largely by the plan of the building and to a certain extent by the methods adopted for heating and ventilating. The ventilating system often includes vertical ducts which supply air to the rooms and exhaust it therefrom. It is readily apparent that when these ducts are built in the walls between two adjoining rooms they become a permanent structure and cannot be removed to another position without great expense, as this would amount to a practical rebuilding of the ventilating system. When the ventilating ducts are placed along the corridor walls it is possible to remove the partitions between rooms and rebuild them at any desired place. The location of ventilating ducts therefore differentiates the *fixed* from the *flexible* plan. Greater flexibility of plan is secured by placing the main ventilating ducts in the corridor ceilings with openings into the upper parts of the classrooms. If these openings are placed in such a way as to furnish the half-units with the required amount of air, the cross partitions can be placed at will without any interference whatever with

the ventilating system. This is perhaps the most flexible plan which has yet been devised for school-house construction.

It is becoming increasingly popular to select the classroom as the basic unit. For this unit two window openings are sometimes provided, which permit this standard unit to be divided in half or to be extended longitudinally to one or more units in length, according to the requirements. In this way it is entirely feasible to plan a schoolhouse without reference to the classroom by merely setting up the limits of the corridors and stairways, permitting the remaining space to be divided into classrooms and laboratories as desired.

The equipment of a modern schoolhouse is such that each lineal foot of wall surface is definitely allocated to some particular use. This wall use is divided between blackboards, various kinds of cabinets, bulletin boards, map spaces and other facilities. In some schools a certain proportion of the wall is utilized for wardrobe cabinets, so that they will be under the constant surveillance of the teacher in charge. Many school authorities prefer this system to the cloak room system, where the wardrobe is entirely removed from the classroom. The wardrobe placed in the school room is saving of floor space because of the elimination of a partition, and the aisle of the school room also serving the needs of wardrobe use. In other words, the area of a partition and an aisle is saved in the plan. In junior and senior high schools where the pupils are not assigned to any particular room, these wardrobes are often placed in the corridors so that they can be accessible without disturbing the occupants of any one room. It can readily be seen that where the walls of the classroom or laboratories are entirely utilized by standard equipment, designed to fit a certain size classroom with a certain size column, an increased size of columns would disarrange this standard equipment and require either a redesigning of the equipment or mak-



ing the rooms larger in order to provide the necessary lineal feet of wall. The type of fireproof construction used results in a minimum or an increased area of ground coverage due to these conditions. The thickness of the exterior wall is affected by the type of skeleton construction used. In one instance a 12-inch wall may be sufficient as compared with a 16-inch wall required by another type of construction. This would naturally affect the extreme width and length of the building a foot or so. The true worth of the structural parts of the school building is established by their comparative strength, durability and adaptability. All of these characteristics should be possessed in the maximum degree. The strength of the materials should be susceptible of accurate determination, not merely based on a theoretical assumption, before they are incorporated in the structure. The materials should possess an enduring strength which does not decrease with age. All materials of whatsoever kind are injuriously affected by exposure to the elements, and this characteristic entails the necessity of protecting them by means of adequate weatherproofing and fireproofing. It sometimes happens that some materials are commonly accepted as unaffected by exposure to air and moisture in combination, or to fire. Observation of their endurance performance under exposure,

however, has demonstrated the necessity of providing essential protection.

Adaptability to Other Uses. The adaptability of the structure to new requirements vitally affects its value. This can be secured only by such a plan in combination with structural parts that are susceptible of alterations, removal, replacement or reinforcement. It sometimes happens that the character of a neighborhood so changes that the need of the school ceases to exist. The problem, then, is whether to adapt the building to an entirely new use in order that it may yield a profitable income or demolish it. In the latter case, the cost of demolition and the amount of valuable salvage are important in establishing the sale value of the property.

Comparative Costs. The comparative initial cost of the structural frame does not establish its real value in the structure. A true comparative cost is determined only by making an estimate of cost based on complete sets of plans and specifications for each of the types of construction. Either one may affect the cost of the foundations because of the difference in the dead weight of the structure; the cost of installing the heating, ventilating and sanitary systems may vary; the cost of plastering, carpentry and brickwork may also be affected. These costs can be known only by making careful, individual estimates.

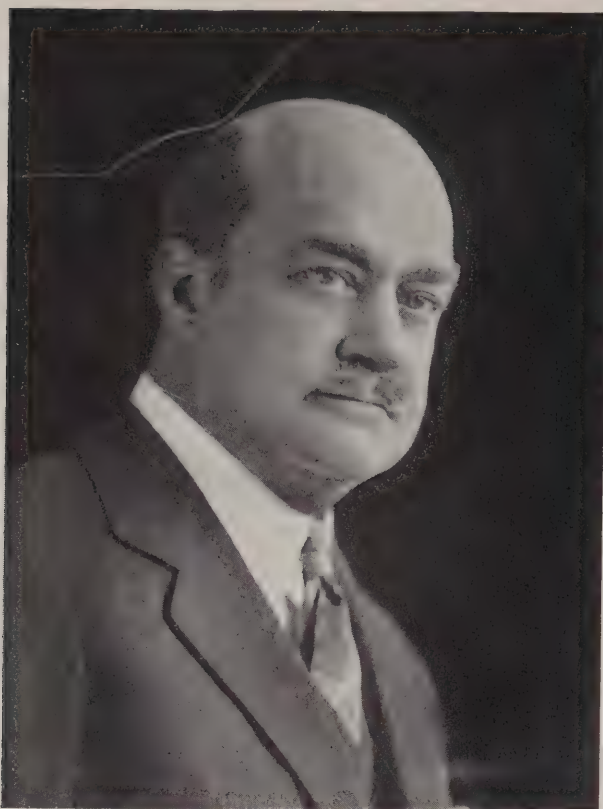


Photo. Strauss

WILLIAM B. ITTNER

WILLIAM BUTTS ITTNER was born, September 4, 1864, in St. Louis. He attended the public schools and the Manual Training School of Washington University, and was graduated as a special student of Cornell University in 1887. Travel and study abroad supplemented his education and enriched his professional preparation. He took up his profession with Eames & Young in St. Louis in 1888, establishing an office of his own the next year. In 1897 he was elected Commissioner of School Buildings for St. Louis, and continued to serve in that capacity until March, 1910, when he was elected architect for the Board of Education, which position he filled until 1916. During the past decade Mr. Ittner has served 59 cities and towns in 24 states as planner and designer of schools. Mr. Ittner initiated and developed the "open plan" in school buildings, which automatically brought about maximum light and ventilation and better design. Aside from his school work, he was architect for the recently completed Scottish Rite Cathedral of St. Louis and many prominent buildings. The A. I. A. elected him to Fellowship, and a medal was presented to him for marked and meritorious achievement in the design and construction of school buildings by the St. Louis Chapter of the Institute, of which he was president in 1895-96. He has served as a member of the board of directors and an officer of the American Institute of Architects. Blessed with an excellent baritone voice and with a genial spirit, he takes great pleasure in music and dancing.



Photo. Potter

JAMES O. BETELLE

JAMES O. BETELLE was born in Wilmington, Delaware, April 1, 1897, where he attended the public schools. He started his architectural career by working for Cope & Stewartson, of Philadelphia. While there he studied at the School of Industrial Arts, and in 1900 came to New York to work for Cass Gilbert. He studied architecture at the atelier of Donn Barber and at other art schools in New York, going to Europe to study in 1905. Returning, he entered the office of John Russell Pope, where he remained until 1910. While with Cass Gilbert and John Russell Pope, he came in contact with Ernest F. Guilbert, and in 1910 they formed the partnership of Guilbert & Betelle. Mr. Guilbert died in 1916. From 1917 to 1925, Mr. Betelle lectured at Columbia University, on "Modern School Buildings and Their Equipment." The course was attended by school principals and superintendents from all parts of the country and from foreign lands, so that his influence on school architecture has not been limited to the buildings he has actually designed. Mr. Betelle believes that architects should render service to the community. Mr. Betelle is now president of the Newark Chamber of Commerce, a member of the North Jersey Transit Commission, and other civic bodies. Mr. Betelle is a past president of the New Jersey Chapter of the A. I. A., and he was elected a Fellow of the Institute in 1927. His hobby is his work, and he seems never to tire, in spite of the fact that he has had but one vacation in four years.

CHECKING SCHEDULE FOR NEW SCHOOL BUILDINGS

BY

JAMES O. BETELLE

GUILBERT & BETELLE, ARCHITECTS

IN order to start the preparation of plans and specifications for a new school building, the architect needs certain information. This information must be furnished him by the board of education after careful consideration and after consultation with the superintendent of schools. It would be of considerable assistance to all parties concerned if the various items on which information is needed or instructions desired could be brought together and listed in a convenient way, in order that they may be considered separately and consecutively and thereby develop the type of building to be erected, together with the materials to be used, and the facilities to be included. Such a list of items is given here, with the hope that it may prove useful to not only the architect, but to boards of education and to superintendents of schools as well. When all the questions suggested in the list have been answered, and the special information requested has been furnished, the architect is in a position to proceed with the preparation of his plans and specifications.

For the information of boards of education and superintendents of schools, it might not be amiss to outline the procedure the architect goes through in making his plans and specifications. The architect first makes preliminary plans and specifications, which he submits to the board of education and the superintendent, for their criticism and approval. Changes can easily be made in these preliminary plans, and possibly the architect will submit a number of different preliminary schemes before a final scheme is definitely decided upon and adopted. Preliminary plans and specifications are just what their name implies, and for the reason that they are preliminary, they can be easily modified and changed. Before approving the preliminary plans, the board of education and the superintendent should give ample time to their study, and the architect will gladly make any desired changes and adjustments in them until they are entirely satisfactory. The time for making changes and adjustments is during this preliminary plan stage, and not when the working drawings are being made or after they have been completed and estimates obtained,—or worse still, during the time when the building is being erected. These belated changes and adjustments cause delay and trouble all along the line, and may mean an additional charge by the architect for changing the completed plans and specifications, and by the contractor if the changes are made while the building work is in progress. From the preliminary plans the architect prepares his contract working plans and specifications, and when they are completed they are usually submitted to the board of education for final approval and authority to advertise for bids, and for sending them out to the contractors for esti-

mates. It is also necessary that the final working drawings and contracts be filed with and approved by the department of education of the state in which the building is to be erected.

While it is the duty of the architect to include in his plans and specifications all the various features and instructions given him by the board of education, it is also the duty of the school board or its representative to know in a general way what the finished plans and specifications include or omit. It is practically impossible for the busy superintendent or the busier school board members to read through the entire specifications and check up everything on the plans, and it is with the idea of simplifying the checking of the plans by the superintendent and board members that this checking schedule has been prepared, which at the same time gives the architect the information with which to start his plans. It is the architect's duty to see that the plans and specifications are complete and agree with each other, and that the state and local laws applying to school buildings have been complied with. Also that the instructions given from time to time by the board of education as to the arrangement, materials or finishes are carried out, and that a complete and substantially safe building is produced when the plans and specifications are realized in brick, stone and mortar. The examination and approval of the plans by the superintendent of schools and the board of education is not made with the idea of relieving the architect of any of his responsibility, but simply to assure the owner that the general instructions given the architect have been carried out.

LIST OF ITEMS

Name of Owner:

Get the correct corporate name of the board of education to be mentioned in the specifications as owner of the proposed building. This is often worded incorrectly.

Kind of School:

Consolidated school?

Grade school?

Junior high school?

Senior high school?

Manual training or commercial high school?

Vocational school?

Organization of School:

Scheme of organization should be given.

Standard or traditional school program?

Platoon, duplicate, or modified "Gary" system?

Number of grades to be taught in the new building?

Capacity of Building:

Total number of pupils for which accommodations are now required?

Number of pupils in various class units? What excess pupil capacity is desired in the building now to be erected?

Rules for Computing Number of Pupils Accommodated in a School Building:

The American Institute of Architects and the Committee on Standardization of School Buildings of the National Education Association have both adopted this method:

"Compute the number of pupils normally accommodated in rooms designed for classes only. Special rooms are to be figured at the actual number of

pupils accommodated for one class period only. Auditoriums and assembly rooms are to be ignored, but gymnasiums may be figured for one or two classes, as the accommodations may provide. No gymnasiums, however, shall be accredited with two classes, if below 40 by 70 feet in size."

It should be noted that the pupil capacity of a building computed on the basis given here represents a *maximum* capacity. It is not altogether desirable to begin the use of a new school building counting upon such rooms as laboratories, shops and other special rooms as home seats. After the school has been built a few years and before an addition can be constructed, it is often necessary to use these special rooms as home seats or stations for pupils, at which time the maximum pupil capacity will be reached. Pupil capacity can possibly best be stated as "maximum pupil capacity," in accordance with the A. I. A. and N. E. A. rules and upon which the cost per pupil is figured, and "normal pupil capacity," which is the desirable number of pupils any building will accommodate and which represents about 80 to 85 per cent of the maximum capacity.

Scheme of Study Rooms:

Number of study rooms and seating capacity of each?
Storage Rooms for Books and Stationery:

Give desired number, size, and preferred location.

Number and Sizes of Rooms for Different Purposes:

Number of classrooms and pupil capacity of each?

Number and kind of special rooms and pupil capacity of each?

The size of a standard classroom is easily determined when the pupil capacity is settled, the size being dependent upon the number of square feet per pupil required by law in the various states. The size of a special classroom is determined by the number of pupils it is to accommodate in each class, and also by the size and arrangement of the special furniture to be used. A school building should be so constructed that changes in sizes of rooms may be easily made to take care of future educational requirements.

Auditorium:

Total seating capacity?

Number of seats desired on main floor?

Number of seats desired in gallery, if any?

Main floor to be flat or sloping?

Area desired for stage?

Shall stage be arranged for scenery?

Built-in fireproof motion picture booth?

Provision for darkening interior of auditorium in day-time for motion pictures?

Easily accessible for community meetings, or other outside purposes in evenings, or at other times without opening up entire building?

Heating and ventilating systems separate from rest of building so room need only be ventilated when actually in use by a large number of persons?

Will auditorium be used for any other purpose, such as gymnasium or study hall?

Gymnasium:

Size and height?

Accommodation for spectators and number of seats desired?

Will more than one gymnasium be required, or an additional exercise room needed?

Arrangement of locker, dressing and shower rooms, and number of lockers and showers desired in each?

Physical examination rooms?

Physical director's office?

Apparatus storage room?

Gymnasium accessible from outside for community uses without opening main part of building?

Note that minimum size of a standard basket-ball court is 35 x 60 feet; maximum size, 50 x 90. A space of at least 3 feet should be allowed all around court.

Swimming pool?

Library:

Size and preferred location?

Number of books at present in school library and probable maximum number in future?

For school use only, or also a circulating library?

If circulating community library, provision should be made for its use outside school hours, evenings and holidays, also provision for heating without running main heating plant.

Library stack room?

Library work room?

Library may also be used to advantage for teachers' meetings and school and community club meetings.

Laboratories (Physics, chemistry, biology, general science, etc.):

Kinds of laboratories?

Number, size, and preferred locations?

Number of pupils to be accommodated at one time in each?

Equipment?

Lecture Rooms:

Number, size, use, and preferred locations?

Seats on raised platforms?

Pupils to be accommodated in each?

Equipment?

Special Rooms:

Number, size, and preferred locations of all special rooms, such as:

Bookkeeping,	Sheet metal shop,
Stenography,	Forge shop,
Typewriting,	Printing shop,
School bank,	Agriculture
Music rooms,	Machine shop,
Domestic science dept.,	Kindergarten,
Laundry,	Mechanical drawing room,
Model apartment,	Freehand drawing room,
Sewing room,	Arts and crafts room,
Men teachers' room,	Museum,
Women teachers' room,	Janitor's room,
Girls' rest room,	Principal's office,
Medical inspection rooms,	Superintendent's office,
Dental clinic room,	Board of education rooms,
Playrooms,	Bicycle room,
Woodworking shop,	Secretary's office.

Give number of pupils to be accommodated in each at one time; approximate size and preferred location of each room; also description of special equipment and accessories.

Lunch Room and Kitchen:

Provision for preparing and serving lunches to scholars and teachers?

Number of pupils to be seated at one time, and preferred location of rooms?

Types of Wardrobes and Method of Taking Care of Pupils' Clothing:

Wardrobes in rear of room?

Separate cloak rooms adjoining classrooms?

Steel lockers built in along corridor walls, or in alcove rooms off corridors, or elsewhere?

Any other special arrangement desired?

Provision for Extension of Building to Take Care of Future Growth:

Buildings should always be designed so that additions can be easily built. It is recommended that a future addition be actually drawn out on the preliminary sketches for future reference. Later boards of education can then see what was contemplated in the way of an addition when the building was planned, and whether they follow it in all its details or not, they at least have a basis on which to start work.

Money Available:

For building	\$.....
For driveways, paths and grading property.....	\$.....
For architect's fees.....	\$.....
For furniture and equipment.....	\$.....
Surplus for contingencies.....	\$.....
Total	\$.....

When It Is Desired to Have School Building Completed:

It must be remembered that for a medium-sized building it takes from two to three months to prepare plans and specifications, and from ten months to one year or more to build the school, depending upon its size.

Survey of Property:

It is the duty of the board of education to furnish the architect with a complete topographical survey of the property. This survey should give dimensions, levels, show streets, locate all trees and existing buildings, gas mains, water main, sewers, electric mains, and kind of current available; also any peculiar features of the property, or any restrictions applying to them.

Test Borings:

The board of education should have test borings made or

test pits dug to determine the character and bearing capacity of the soil; also to locate the level of sub-surface water, and the location of rock, if any. Neglect to determine the character and depth of the underlying soil has many times been the cause of great expense later on, when the construction of the building was under way.

Work to Be Included or Not Included in Contract:

Are lighting fixtures to be included or purchased later?
Is entire property to be graded, or only just around building?

Are roads, paths and sidewalks to be included?

Is the architect to include the handling of furniture and equipment or any special items?

Temporary Facilities While Building:

Decide who furnishes and pays for water, light and heat, used during the construction of the building,—the owner or contractor?

Investigate cutting down of certain trees within the area of new building and the boxing around or protecting of those trees which are to remain.

Removal of any old building on site and disposal of old material? Is it desired to save any old materials?

Insurance of Building During Construction:

The board of education usually insures the building against fire and tornado during construction, for the benefit of all parties concerned, as their interests may appear at the time of loss. Liability insurance and damage to persons or property is carried by the contractor.

Method of Making Payments to Contractors:

This is usually done monthly, upon certificate of the architect, and equal to 85 per cent of the value of labor and material actually incorporated into the building at the time of calculating payment. The remaining 15 per cent accumulates as a final payment, which is generally made within 30 days after completion and on acceptance of the building by the owners.

Book Lifts, Dumbwaiters, Dust Chutes:

If any are required, number, size and location should be given. Vertical shafts and doors to them should in all cases be fireproof.

Wainscoting in Corridors and Classrooms:

Lower walls of classrooms, and especially corridors, are subjected to heavy wear and abuse. Wainscoting of painted burlap is often used in classrooms, and of glazed brick about 5 feet high in corridors.

Sound Deadening of Floors or Partitions:

Certain floors and partitions, such as the floor of a gymnasium, where located over an auditorium, or a toilet room adjoining a classroom, need to be insulated and have sound deadening. There may also be other cases where such sound deadening is required, as, for instance, around music rooms, gymnasiums, noisy shops, etc.

Waterproofing:

What measures have been taken to make walls and floors of rooms below grade waterproof?

Do soil conditions make a tile sub-surface drain necessary around building?

Materials or Appliances to Be Used in the Building:

Materials and trim used on exterior?

Building of fireproof or semi-fireproof construction?

Kind of floor construction?

In a fireproof building it is assumed that all floor construction is fireproof, although the roof construction is sometimes built of heavy timber to save money. In a semi-fireproof building it is usual to make the corridors and stairs fireproof, and also floors and ceiling of boiler room and manual training room fireproof. Other construction of wood.

Materials of roofs?

Kind of wood for inside trim?

Kind of wood for classroom floors?

Kind of floors in corridors?

Kinds of floors in miscellaneous spaces?

Kind of floors and wainscoting in toilet rooms?

Type of windows,—double-hung, hinged, or special type?

Kind of stairs?

Spaces where wall or ceiling, or both, are not to be plastered?

Ash lift or other provision for getting ashes out of boiler room?

Are outside woven wire window guards required for protection of windows on lower story?

Any folding iron gates across corridors desired to cut off certain portions of building when auditorium or other rooms are being used at night?

Any iron fence desired around playgrounds and rest of property?

Any fireproof record vault required?

Bolts for window cleaner's belt on outside of all window frames above ground floor?

Kinds of blackboards and their location?

Cork display boards in classrooms and bulletin board in corridors?

Any folding or rolling partitions required between classrooms?

Are partitions between toilet fixtures, wood, metal, soap-stone, slate, etc.?

Bookcase and teacher's closet in each classroom?

Metal-covered doors to boiler room and manual training rooms, closing them off from corridors and basement?

Metal-covered partitions and doors glazed with wire glass enclosing staircases and acting as a smoke and fire screen?

Special locks for special rooms, such as principal's office, laboratories, etc.

Key system for various rooms and master key for all doors?

Metal numbers or card holders on doors to classrooms?

Panic bolts required on all outside doors?

Any spring checks desired on outside or inside doors to keep them closed?

Plaster walls painted, and where?

Painting of brick walls, and where?

Painting of cement floors?

Lettering of doors to various rooms?

Special decorative painting of auditorium and main entrance hall?

Quality of glass used in outside windows?

Quality of glass used in exterior and interior doors?

Obscure glass used in such places as toilet room windows, shower and locker rooms, etc.?

Wire glass for fireproof partitions, doors, and stair enclosures?

Plumbing:

Location and size of water main, sewer, and gas main?

Any apparatus for hot water? Kind, size and location?

Locations of fixtures to be supplied with hot water?

Is plumbing a cast iron or screw pipe project?

Disposal of rain water on surface of ground or into sewer?

Pipe covering on hot and cold water and steam pipes?

Connections on outside of building for water hose?

Are fire line stand pipes and hose reels desired in corridors?

Type of plumbing fixtures. Number of fixtures usually fixed by regulation of the state department of education.

Location and number of drinking fountains?

Sewerage disposal plant required where no sewers are available?

Inside cast iron rain water leaders from roofs or outside sheet metal leaders?

Any laundry tubs desired in connection with domestic science room?

Any pipes running through cold air rooms or any unheated spaces should be carefully covered to prevent freezing.

Any gas outlets in corridors, stairs, auditorium, etc.?

Provide gas outlets in laboratories, lunch room, domestic science room, boiler room, teachers' room, etc.

Electric Work:

Obtain full information as to the kind of current and its phase and voltage furnished by the local lighting company, together with location of service connection.

Number of lights in classrooms and control of them?

Any outside lights at entrance?

Base receptacles where needed?

Electric outlets for special furniture in laboratories, demonstration tables, etc.

Outlet for motion picture or stereopticon machine?

Footlights and overhead lights for stage?

Location of program bells and how operated; by a program clock or hand push-button?

Electric power outlets for motors, fans, etc.?

Outside door push-button ringing bells in front corridor and boiler room?

Special program bells in noisy rooms?

Push-button and buzzer from stage to stereopticon location?

Fire alarm bells and their location? How operated?

Bells, telephones and clocks operated by dry batteries or storage batteries?

Long distance outside telephones?

Any interior telephone system? Location of central switchboard for interior telephone system?

Number and location of interior and outside telephones?

Number and location of secondary clocks in classrooms which are operated by master clock in principal's office?

Locations of master clock, program bells, switchboard, fire alarm switchboard, telephone switchboard?

Any electric outlets required for electric irons or electric stoves?

Kind and design of lighting fixtures?

Is electric service wire from street main run exposed overhead on poles or concealed in conduit below ground?

Heating and Ventilating:

Type of heating system: one-pipe, two-pipe, vapor or vacuum system?

Are fans to be used for either or both the fresh air supply and exhaust ventilation?

Type of boiler or furnace?

Kind of boiler grates,—stationary or shaking grates?

Kind and size of coal to be burned? Oil-burning boilers in certain localities?

Special provision for heating principal's office, board of education rooms, superintendent's office during winter holidays and evenings, so entire building will not have to be heated?

Is automatic temperature control called for? What sections are so controlled?

Special ventilation for toilet rooms, independent of school ventilation?

Piping system to be valved for separate control of direct radiators in classrooms, auditorium, etc., and for indirect air heaters for ventilation? Also sections of building to be shut off in case of accident to any part of system?

Classroom and auditorium heating and ventilating controlled separately, so that either section can be used without the other?



Tower, High School, South Orange, N. J.

Guilbert & Betelle, Architects

SPECIAL ROOMS IN HIGH SCHOOLS

BY

DWIGHT H. PERKINS

PERKINS, CHATTEN & HAMMOND, ARCHITECTS

PROGRESS in education necessitates constant change in schoolhouse planning. This constant change is due not only to change in the requirements in order to carry out certain newer methods in the teaching but is likewise due to very rapid increase in the high school population. Whatever may have caused this increase in high school population, we have it with us and it must be provided for. School boards are further embarrassed by having thrust upon them the problem of erecting more buildings at a much higher unit cost. The reaction to this very simple problem of providing more buildings for more pupils at enormously increased prices has caused the demand for the strictest economies in floor planning. In the good old days when a high school building meant classrooms of large proportions with an occasional room designated the "laboratory," and another the "library," there was no particular need for research and study of methods for economy; but nowadays, with seating shortage prevailing in almost every school district in the country, and with boards of education bewildered because of no available funds and very serious restrictions as to the measures for increasing their funds, everybody,—architect, school administrator and members of the board itself,—is vitally interested in every measure which will conserve space and at the same time not interfere with the full opportunity of the student and the convenience of the instructor. Unfortunately, this last item has been given little attention. No business corporation would employ high salaried people such as are employed in our modern high schools and handicap them from day to day with a non-workable, unproductive environment.

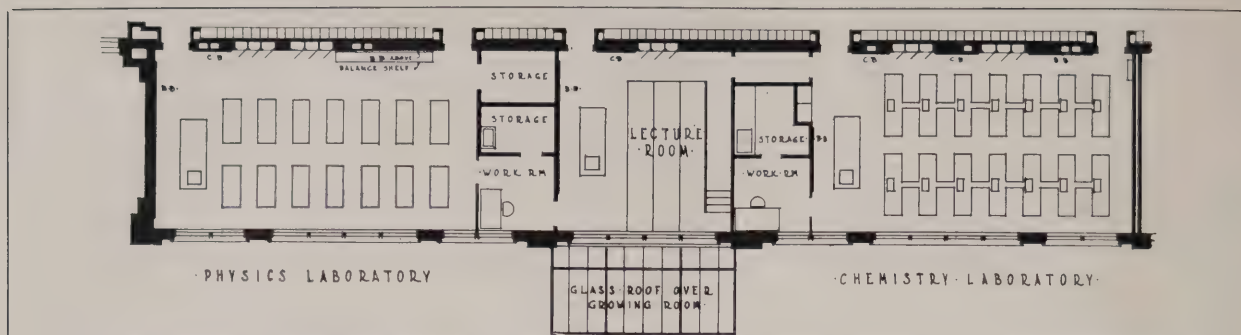
It is with this situation in mind that this discussion of special rooms is undertaken. The special rooms have become a large factor in the high school. Academic rooms in a modern high school seldom exceed 50 per cent of the number of the total units provided for the operation of the school. In a recently planned high school for 1200 pupils, it was found that only half of the total recitation units to be provided were actually classrooms. In addition to the recitation units, there is required the usual office space, as well as study halls, library, lunch room, gymnasium and assembly hall, all of which may come under the designation of "special rooms."

Laboratories. Within recent years, there has been developed for use in laboratories special equipment built around the necessity for conserving space, adding to the convenience of the pupil, and giving some attention to the administration of the room as a teaching unit. The most recent development in this field is a series of tables connected back to front through the center of the table by a narrow compart-

ment through which the plumbing and other service lines are laid. A part of this narrow compartment is used for storage; in some instances, bottle racks; in others, the less frequently used apparatus. This scheme has some points in its favor, particularly in chemistry, where the disposal of waste has always been a very definite problem. By utilizing this scheme, the sewer line can be brought to one point above the floor and then be carried under the floor slab to the corridor wall without disfiguring the ceiling of the room beneath the chemistry laboratory with unsightly pipe lines and their occasional leakage. The plan of this type of table is shown in an accompanying drawing for the chemistry laboratory. (Page 426). The further advantage in the use of this table is that with only slight inconvenience it can be used for other laboratory work, such as physics, biology or general science. Its fundamental weakness is that it requires a low height if used for other purposes, and, consequently, pupils are generally seated, occasionally with attached chairs, which makes more numerous opportunities for accidents. The pupil at a chemistry table requires for his own safety and convenience at least the opportunity to stand while working. The second criticism is the lack of circulation for the instructor, which is an essential where individual instruction is considered fundamental.

Another type of recent development in laboratory equipment is the two-pupil table, which is coming more and more into favor, because it does provide for the concentration of two pupils on one problem, for the utmost freedom in supervision, and for the ready adjustment of the room in providing for additional pupils. For use in physics and biology, as well as for general science or other laboratories where plumbing is not a major requirement, this two-pupil table is a distinct contribution. It is in marked contrast to the old six- or eight-pupil table set full width of the room, except for an aisle at each end and usually requiring that half the pupils face the other half. Only the extreme necessity for conserving space can justify the utilization of this old type of multiple-station table. The two-pupil table has another distinct advantage, in that its equipment is easily modifiable to suit the individual projects for all succeeding occupants. If properly equipped, the modern school occupies all of its recitation units every period of the day, which means that the science laboratory is used by four different classes each day, and on alternate days by another four.

Placing Equipment. It is essential that full consideration be given to the best utilization of the space available. It should be remembered that pupils spend most of the time at the work tables, and therefore it is essential that tables be given first call on



Laboratories, Lecture Room, Growing Room and Services

Senior High School, Fort Smith, Ark.

Perkins, Chatten & Hammond, Architects

the best light of the room. In many old laboratories everything except the pupil's table is close to the light, placing the pupil's table on the dark side of the room. For instance, the balance or microscope table is frequently placed under the windows, with the presumption, obviously, that it should be near the light. Modern artificial light is so efficient and so easily provided and these units are used so seldom that we recommend placing these tables on either the rear or corridor wall of the laboratory. The instructor usually objects until he sees how it works.

In a chemistry laboratory, fume hoods are a necessity, but generally a nuisance. If the fume hoods can be located before the structural plans are determined, confusion and expense can be avoided by proper location of vents. In order to get positive exhaust of these fume hoods, the installation of small fans, which, by the way, will improve the ventilating of the whole room, should be made in the vents. Various experiments are under way now for the installation of fume hood facilities on the pupil's desk itself. No doubt this will become a practical device in due time, but as yet we are not ready to accept this idea. It requires much more expenditure than would seem justified for satisfactory operation.

One of the most constant sources of annoyance in all laboratory work is lack of the proper storage for notebooks. Various schemes are being used. Recently the notebook rack has been heralded as the solution for the evil, but in actual operation, the notebook rack is an invitation to copying and petty annoyance. Some protection should be given to the pupil by providing cabinet locks for each class using the racks. It may be the occasion for a little additional expense or inconvenience in distribution, but it saves in the long run those annoying circumstances which so frequently arise in the conducting of the class. Under certain circumstances, office files, each section locked separately, have proved useful.

Ample bulletin board spaces for the posting of announcements or display of excellent work are a great convenience. These should be placed near the most used exit, as should also the file cases or notebook racks. A very limited amount of blackboard

is sufficient. A folding blackboard in 4½-foot sections, so that the work of each class may be retained without interfering with that of other classes, is the most serviceable. It costs more to install in the original layout, but it leaves space for other purposes.

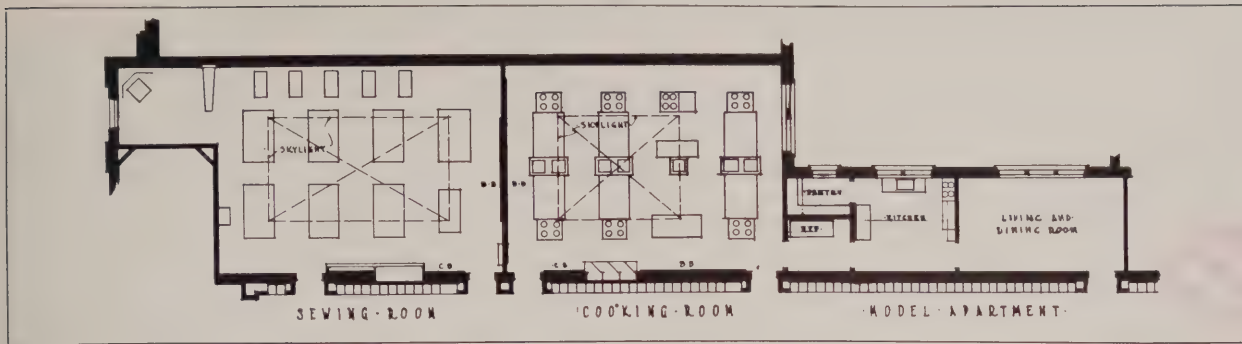
Care of Equipment. It is the duty of the architect to provide for the best care of all equipment. It is a remarkable fact that neglect costs more than the actual use of certain apparatus. To place the storage area in some dark corner, frequently in a segregated place, is to insure rapid deterioration because of neglect of the apparatus. Whatever the architect may do to provide for this care, only the most persistent effort on the part of those responsible for the school's administration, will guarantee the proper use of facilities. The architect should assume the responsibility for making this care a possibility.

Accessories. In addition to the regular laboratory space, every suite of laboratories should have well equipped lecture rooms so placed that they may be used to supplement more than one laboratory, and so organized that they will be easily accessible from the private workroom of the instructor. In biology, much confusion is saved by providing growing rooms or greenhouses in connection with lecture rooms.

The accompanying plans proposed for the Fort Smith, Arkansas, High School illustrate most of the measures which have been suggested. We should note, however, that the faculty of the school prefers to use the two-pupil tables in the chemistry department, because of added convenience, and such has, therefore, been planned. The biology laboratory is on the first floor immediately under the physics laboratory; and classrooms, planned for conversion into an additional biology laboratory, should it become necessary, are beneath the chemistry laboratory. The physics laboratory was not needed for full time, and therefore provision was made for extra storage room, so that this laboratory might be used to supplement the one biology laboratory for which the demand was temporarily out of proportion.

Girls' Shops

The cooking room is one of the hardest units in the whole building to plan. There are two major



Sewing Room, Cooking Room and Model Apartment

Senior High School, Fort Smith, Ark.

Perkins, Chatten & Hammond, Architects

types of plans. Incidentally, it might be said that those responsible for the operation of this unit are quite positive in support of whichever plan they favor. The older plan is that which became so common some 20 or 25 years ago, when cooking was being generally adopted as a school activity. This consisted of a hollow square, open at one end, furnishing a place where materials could be prepared and cooking operations be conducted either by the pupil individually or by the instructor as a demonstration. It had its advantages, many of which cannot be continued in the newer type of organization. It was cheaper. It gave the instructor an across-the-table contact with the individual pupil with a minimum traveling distance. It had the disadvantage of forcing too many pupils into very limited space.

Recently, there has been developed the so-called "unit" plan, wherein a sample kitchen is built for each two, three or four pupils. Its adherents claim for it the advantages of simulating home conditions. Some of its opponents have pointed out that there is only one cook at home with about twice as much space as that usually devoted to two students in the school, and that the reproduction of home conditions is far from actual. Others seriously question the necessity for an attempt to reproduce the home environment. Somewhere in between the two extremes is the sound middle ground upon which most teachers will finally come to an agreement. As between these two extreme viewpoints, the poor architect does not dare make a choice. If he plans for one type, the other will be wanted within a short time, because the change of teachers in this department is usually due to a change in the opinion as to the proper method of securing results. It is not at all impossible, however, for the architect to provide a distribution of his units in such a way that segregation into individual compartments may be inexpensively provided, or vice versa. Insofar as it is possible, the equipment used by pupils should be common to each station in a cooking room. This lessens the confusion in getting materials and is conducive to continuity in developing any given project. As in other laboratories, provision should be made for adequate storage space of frequently used apparatus, and a compact

but easily accessible filing space for notes. One of the most common faults in this particular laboratory is the omission of space for the storage of aprons or other clothing which should be worn by the students while engaged in this activity.

The accompanying plan is not quite illustrative of the point in hand, because we had the distinct advantage here of a room lighted with a skylight. However, it does illustrate the possibility of providing space for small groups with sufficient segregation for good operation. This is on the same principle as that defined in the planning of the laboratories for this same school. The somewhat unusual floor plan of the cooking room was developed by the faculty of the school after much study of the problem and the discarding of many suggested plans.

Sewing Room. As this room does not require fixed equipment to any considerable extent, great freedom can be exercised in its planning. The equipment has usually consisted of sewing tables fitted with individual drawers for the maximum number of pupils using this room. However, as the schools have become crowded and the requirement for full-day use of this unit has developed, it has become practically impossible to provide so many drawers of adequate size in an ordinary sewing table. The tendency now is to use a very simple table with an open space provided for the placing of separate trays, which take the place of the drawers. These trays are individual and are cared for in stacks with locking devices or doors. The proper distribution of these trays is a simple matter, but it seems to have become objectionable to some people who have had difficulty in organizing the procedure. The minute of confusion in the distribution of these trays is fully compensated for by the greater amount of working and storage space which each individual pupil has, and therefore, better opportunity to organize her belongings. The sewing room should be provided with display space as well as storage space. It has been found advisable to segregate these two because the front of the storage space cannot be kept organized for display purposes, and if the display space is used for storage, it is always out of order.

Where both sewing and millinery courses are of-

ferred, the school can very readily use the same room for both purposes if, in addition to the main room, a small room is provided with storage space, well equipped with shelving. One of the most frequently misused features of equipment of the sewing room is a triple mirror. These are not only expensive, but they are easily and frequently broken. Taking the cue from the large department stores, the architect will find that a much simpler device is much more efficient. Setting one mirror on the wall with one side extended from the wall line a few inches, and then using one other mirror hinged to the opposite wall or else on a movable frame, gives an efficiency fully equal to that of the triple mirror.

Placing sewing machines in disappearing cabinets improves the appearance of the room and leaves the well lighted portion for the work tables. In general, the equipment of this room can be simplified and made more efficient by a careful study of the best practices in our large department stores.

Model Apartment. The home-management or home-making courses offered in our schools frequently lead to the building of a model apartment within the school building. This may seem to be an extravagance at first thought, but when one remembers the many purposes for which such a space may be used, the expenditure can be justified. Where nothing more can be provided, at least the kitchen and dining room should be built in close proximity to the cooking laboratory. The accompanying diagram of the Fort Smith, Arkansas, girls' shop illustrates well how the two may be coordinated. For instance, the refrigerator which serves the cooking laboratory, is a part of the kitchen in the model apartment. Frequently, the appearance of the model apartment has been ruined by the use of a ceiling height equal to that of the regular classrooms. This is not necessary, and should be avoided.

Small School Requirements

We who have been planning school buildings for large urban centers have almost completely lost sight of the problem confronting our neighbors in the smaller communities. A very large percentage of our high school children are housed in schools where the number of pupils does not justify the provision of all of the facilities ordinarily found in our larger high schools. This should pique the interest of the architect and the school man to develop a combination which will be effective and inexpensive. A plan of a combined laboratory and household arts room accompanies this article. (Page 430). It shows how, by providing separate storage space for the materials and apparatus of chemistry, for physics, for household arts, etc., the same room may be used for all purposes. It is essential that separate units be vented. Many other combinations, of course, could be made for this type of combined laboratory. The equipment would consist of a plain, easily modified table; even a separate top for this table might be provided when it is used for chemistry. Of course

this does not meet all of the requirements of a modern laboratory, but some of the best chemists in this country had their early training in a laboratory where all waste was handled through the medium of a half-barrel in the middle of the room. The farm boy needs his chemistry as much as does anyone else. A similar combination can be made of commercial art and mechanical drawing rooms. It is pitiable to see how students in the smaller districts are handicapped by lack of thinking in terms of combining.

Boys' Shops

Wood Shop. This department has become quite standardized. For the lower grades, say the junior high school, the standard form of work benches together with a simple saw, and possibly a sanding machine, are generally accepted as sufficient. For senior high schools and trade schools, more equipment is necessary. Teaching through production requires modern industrial machinery. One of the main problems in these wood shops is the care of tools, which are used by successive groups throughout the day. We are recommending an accessory room where an individual tool kit equipped with all the cutting tools required in this work can be stored. This requires a little more time for distribution, but it saves enormously in the time spent with poor tools because somebody else was not responsible for their care. These individual kits can be placed in sections which can be locked, thus avoiding borrowing. Everyone takes greater pride in that which is his own. The school's investment is not materially increased, because the individual set of tools for each pupil gets less proportionate wear in the long run because of its more particular care. The space required for these tools is not expensive when properly organized. A very simple method is to provide storage space to the ceiling with an iron stair and platform at convenient height. If this scheme is used, the old-fashioned tool room can be reduced in size or eliminated.

Auto Shop. The auto shop is the most variable of all shops that have been provided in our schools. It is essential that it may be entered from the street. Outside of this there is nothing in common in the general practices throughout the country.

Electric Shop. To teach the electrical trades in a high school, it is necessary to have quite adequate space. There is a growing tendency to combine this with the auto shop, and to confine the instruction in principles to the physics laboratory. However, as electricity has come more and more into common use, the trade schools especially have required a segregated shop for teaching purposes. In the electrical shop, much shelving is required. It is shallow, however, and simply means that the architect provides wall shelving in small narrow compartments. Deep bins and drawers should be had only in limited number.

Print Shop. One of the most serious problems in laying out a print shop is the securing of adequate light. Natural illumination in a print shop is less

practical than in any other place in the school. The work is such that it requires adequate artificial light, and therefore it is not objectionable to use some space which has shortage of natural light, and thus definitely depend upon artificial light. To equip a print shop in the school as a commercial shop is necessary only where advanced courses are given, or where full-fledged journeymen are trained. The problem confronting the architect is to get the school to definitely define its limitations in this field.

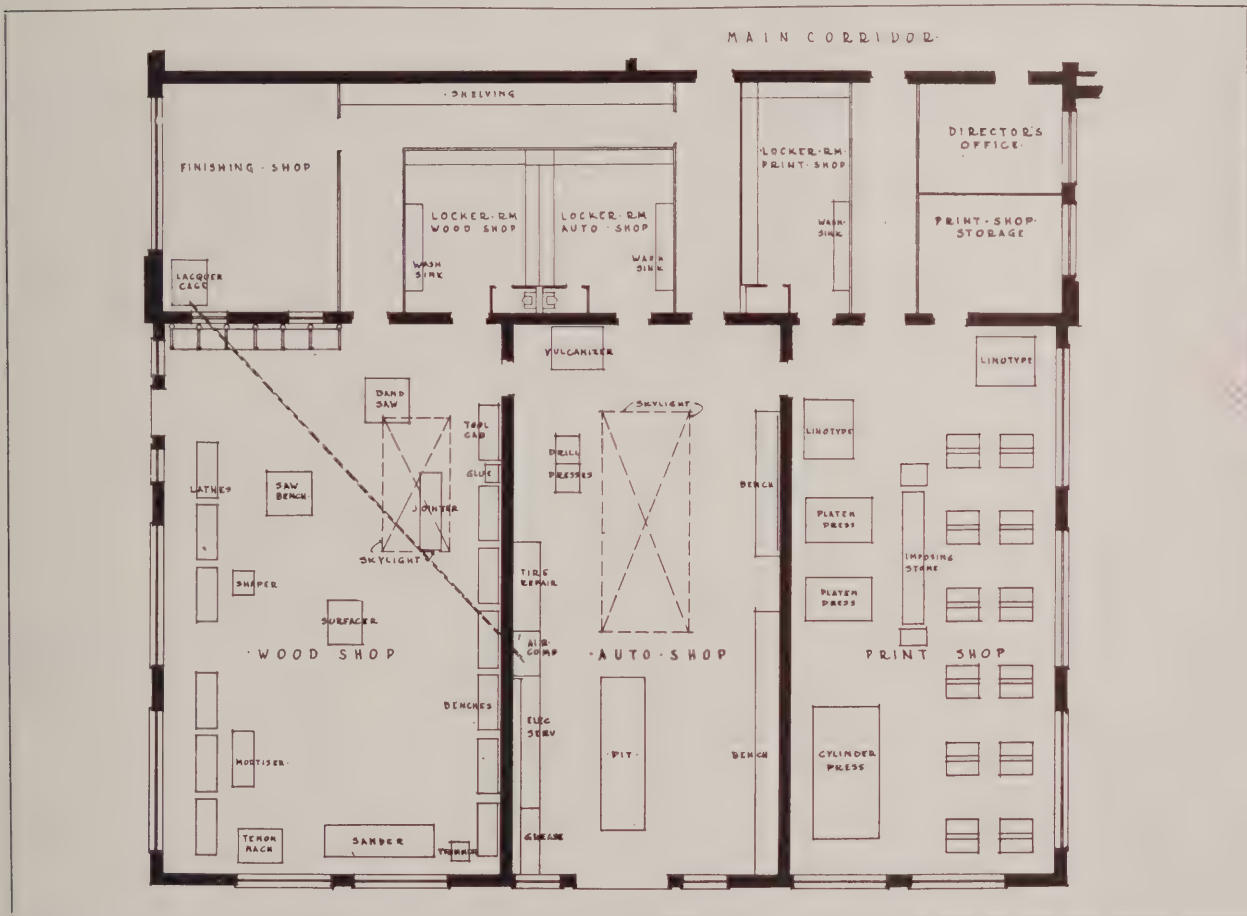
Sheet Metal. To give adequate courses in sheet metal work, only a very limited amount of space is necessary. It is not essential to do work on large units. The principles involved can be taught with very simple equipment, and by the use of small projects. Probably the most effective organization is found in a shop with a well equipped 30-inch, counter-high table underneath the windows. For this purpose, a bilateral lighted room is desirable. The space underneath the bench can be organized into storage space; the corridor side of the room can be equipped with shelving for display of projects and the housing of tools, equipment, etc.

Locker Rooms. In our boys' shops, it is quite essential that adequate locker space and washing space be provided. Most boys like to remove their

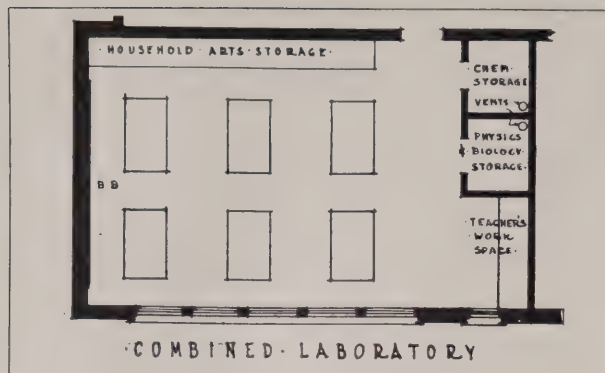
ordinary clothing and change into working clothing before going into the regular daily exercises. This is one of the essential reasons for the increased size of the shop unit, so as to provide this locker and dressing room space. A simple equipment consists of a double tier of lockers about 10 x 15 x 36 inches, one compartment for each boy in the maximum sized class, and basket racks for the storage of work clothing, one compartment for each boy taking the course.

Mechanical Drawing. It is well to locate the mechanical drawing room near the shops, because of the general articulation of the work in these. Mechanical drawing supplements shopwork. Shopwork should not be undertaken without definite drawings. To motivate mechanical drawing, it is essential that these principles should be recognized. Adequate artificial light must supplement the best natural light obtainable. It is almost impossible to secure adequate natural illumination at all times. Many prefer north light for this purpose, but well regulated skylight is equally valuable.

The equipment of the mechanical drawing room requires great care. Too often its utilization is limited by the number of individual compartments in the pupil's desk. In order to get more compartments in a desk, the space for each pupil has often been re-



Shop Unit
Senior High School, Fort Smith, Ark.
Perkins, Chatten & Hammond, Architects



Laboratory for Small School
Perkins, Chatten & Hammond, Architects

duced until it is hopelessly inadequate. The compartments should conveniently hold full-sized drawing kits and drawing boards with unfinished work attached. Extra classes to any desired number may each be served by a locked cabinet with the same compartments as those built into the desks. The instructor's table should be equipped with large shallow drawers for the storage of materials and drawings, and if many pupils are housed, this should be supplemented by a separate cabinet. Ample tack board and display rail for presenting subject matter or displaying finished products are essential. Very little blackboard space is needed.

A blue-print room should be incorporated in, or adjoin the mechanical drawing unit. If the blue-print room is well equipped, it can occupy a very limited space and yet be thoroughly efficient. It does not need outside light, and therefore, it can frequently be provided out of space undesirable for regular classroom purposes.

Art Rooms

What has just been said about mechanical drawing, applies equally well to the art room. This room must, for its best operation, be proportionately large, because it is necessary to have much open space in the front of the room, or, where movable furniture is used, in the center of the room. The art room should have running water, preferably in a sink with ample drainboard space. Running water in an ordinary wash bowl is almost useless. In addition to the requirements for the storage of large materials and individual kits and drawing boards needed in the mechanical drawing department, the art room requires much space for apparatus and its more varied materials. A generous sized room left to be equipped as needed is a great convenience to the art department.

Music Room

Probably no other one factor has contributed more to the shortcomings of the American people in the development of an appreciation and production of good music than has the handicap of inadequate space with which the American teacher has been required to work. The assembly hall is still the music

room in many schools, and it is a rare teacher who can get results in this environment. In the first place, it invites overloading of the classes. In the second place, it is frequently unavailable at the regular class periods; and finally, the proper care of materials is an impossibility. A unit where music and dramatics can be equally well housed has much better possibilities. An oversized classroom,—as much as a unit and a half,—fitted with a small stage or platform, having adequate storage space, and located so that it can be segregated from the rest of the building, gives a much better opportunity for doing those unusual things which must be done in order to produce the best results. The use of the top story for this unit adds something in the way of isolation. In large high schools, a top story consisting of the music and possibly the radio departments only, is quite feasible. Where the music department must be provided for on the same floor with other units of the school, a simple scheme for isolation is to build all of the storage space on the wall or walls adjoining the other units. If this amount of storage space be not needed, it does not add greatly to the expense of the building to have a dead air area provided by furring out some distance from the wall.

Commercial Department

The proportion of the building needed for this department varies so extremely in different communities, and for that matter at different times in the same community, that planning for future expansion becomes essential. This can be done by planning classrooms with no unusual equipment adjoining the commercial department in sufficient number, so that practically an unlimited expansion is possible.

There is a distinct advantage in planning the commercial department as one unit. However, administration on adjoining floors near a stairway is less difficult than it is to have widely separated units on the same floor. There are only a few new movements in this department which require the special attention of the architect. The outstanding one of these is the replacement of the old method of bookkeeping by the machine method. Numerous electrical outlets, giving a maximum of flexibility in arrangement of the room, is less expensive than continuous alterations in order to get this flexibility later.

Bookkeeping. In bookkeeping, the utilization of the room is too frequently lessened by the number of drawers in the desk adopted. Six drawers seem to be about the maximum that can be provided, yet the school is called upon to organize as many as eight or ten classes in this subject. This can be done by providing a vacant space in the desk where the drawer or other container for the pupil in the extra classes can be placed while he is working. Cabinet space will house the extra drawers when not in use by the pupil. The individual lighting of desks may prevent eye strain, but care should be taken to prevent light from one desk reaching other desks.

Typewriting and Stenography. The teaching of typewriting and stenography may be combined in one room for advanced courses. The first courses in each of these should be given in separate rooms to avoid duplication of equipment which lies idle in a room housing both courses. In the typewriting room, ample file cases will make it possible for each pupil to learn something about filing, and at the same time keep a record of his own progress. The self-appraisal of one's own work in this subject makes for progress. In both the typewriting and the stenography room, a folding blackboard with tack board and display rail increases the efficiency of the room.

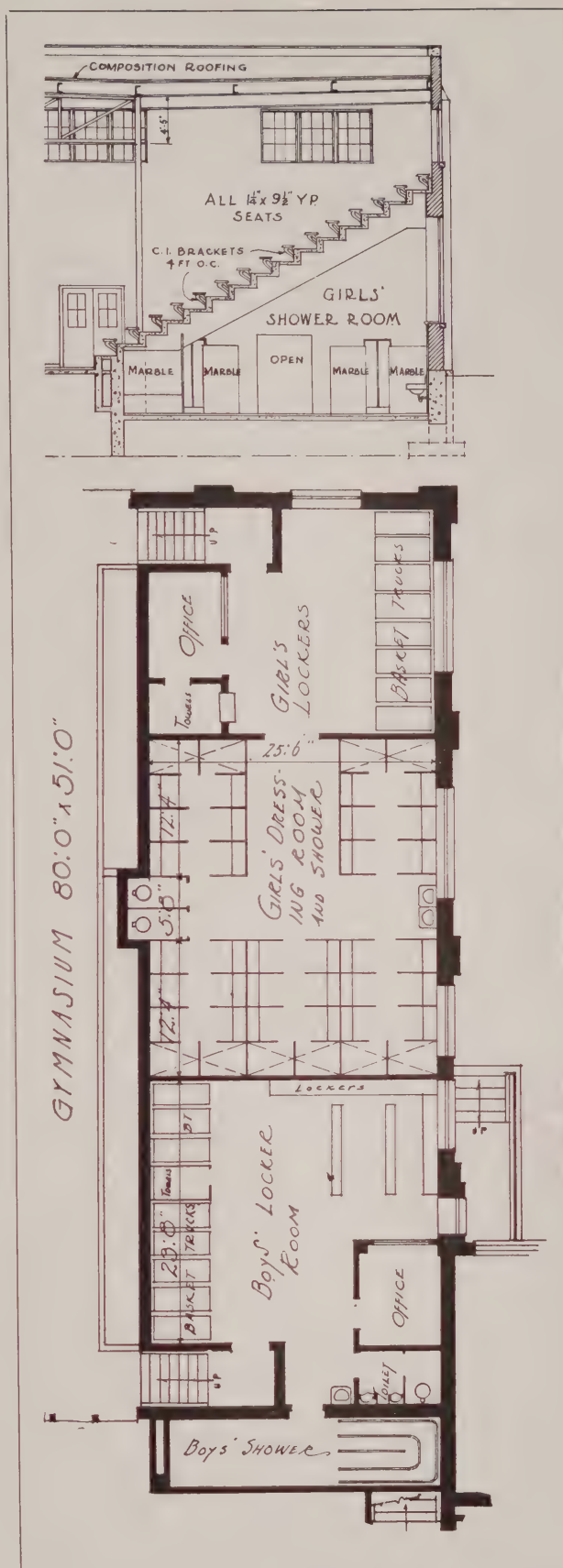
Library and Study Halls

The major features of a high school library are quite different from those of a public library, yet there are times when the same quarters may be used to house both, the public library being operated out of school hours, and, if necessary, its books being distributed to high school pupils only during regular library hours. The community use of this portion of the building is usually at its peak in other than school hours, so that there is no necessity for increasing the seating capacity of the reading room much beyond that demanded by the school. There is a general feeling among librarians, not shared fully by school people, that all libraries should be on first floors, because of better access. In planning buildings, to put the library on the top floor is a distinct advantage, because both sides of the corridor and the corridor itself can be combined in one unit without expensive structural features. This distinct advantage is lost when the library is put on the ground floor.

The school that utilizes study halls as a part of its program has an excellent opportunity to develop self-reliance and individual power in its pupils, if the school assures the pupil of the equipment,—texts, materials, etc., which may be necessary to keep him profitably occupied when he finds himself without assignment sufficient to take the full period in the study hall. A few copies of every textbook used and the most generally used reference material should be easily accessible to every student in the study hall. Book shelving, material racks, dictionary stands, and some deep bins for storage of materials, will aid the school administration in carrying out such a program. If the library is kept close to the study hall, additional advantages arise. Every pupil should form the habit of using the library before leaving the school.

Gymnasiums

There are some changes taking place in the attitude toward equipping the gymnasium. One of these is the demand that it be treated as a playing space, equipped for basketball, volley ball, and similar games, but not equipped with the numerous devices for individual exercise, which are infrequently used. These devices do have a place in the school program, but their use should be restricted to a small corrective department. They clutter up the appearance and



Plan of Locker and Shower Rooms, with Section Showing Seating Above

Senior High School, Fort Smith, Ark.

Perkins, Chatten & Hammond, Architects

the use of the main gymnasium. Locker and shower space can easily be placed beneath the bleachers or seating space if this be concentrated on one side of the playing floor. The relative merit of this scheme, as compared with placing seating on both sides of the playing floor and housing the shower and locker room in another part of the building, varies in different communities. Where the cost of construction of cement seating space, which is the only fireproof form of construction feasible, is very much cheaper in narrow sections, it sometimes becomes less expensive to forget the space beneath it, and to provide the shower and locker space in light construction adjoining the gymnasium.

The Lunch Room or Cafeteria

From the early high school lunch room, operated by the struggling household art department, to the present-day elaborate cafeteria, operated on a strictly commercial basis, was a long jump. Perhaps the planner of high school lunch rooms can do no better than to keep closely in touch with the commercial development in this field, and incorporate for his client the best ideas produced. The equipment has been thoroughly standardized and is briefly discussed elsewhere. The chief problem in current planning is how to make use of the lunch room floor area at times when not in use as a cafeteria. The high school administrator begging for more room is tempted to make use of this space for purposes for which it never was intended. Here is where the architect serves his purpose. In developing a plan, dual use should be kept in mind. Two questions arise. The first is, "Why must the whole unit be one open space?" This is a universal demand, based upon ease in supervision, but which is subject to considerable criticism. The second is, "What device is best for segregating the unit into smaller units for classroom or other purposes?" Folding partitions, roll curtains, light screens, have all been tried and found wanting. Will not someone, with more daring than the rest of us, plan a dining room with the outside, well lighted area divided into approximately standard classroom sizes by permanent partitions, and let us see how it works? Some extra doors in these partitions would facilitate the use of the recitation units for lunch room purposes. I believe this would be superior to any attempt to use movable partitions.

The size of the lunch room is an important factor. School administrators are inclined to underestimate the number of pupils who will demand service when a new project is being introduced in a community. Considerable expansion of the use of the lunch room can be made by extending the number of lunch periods. Many pupils are ready to eat their lunch at 11:30, and 30 minutes seems to be long enough in most schools. By using three 30-minute periods, pupils who do not take lunch at school can usually be given two of these periods, which automatically increases the range within which it is possible for pupils to go home for their lunch.

Assembly Hall

If an assembly hall is to be used for bringing the whole school together, as was originally intended, then our problem is almost insurmountable. With high schools quite commonly having as many as 3,000 pupils, the assembly hall becomes an institution equaling in size a commercial theater. Ex-superintendent McAndrew of the Chicago schools claims that the assembly halls should be built primarily for educational purposes, and that, therefore, it is large enough when it seats a sixth to a fourth of the student body. Incidentally, this meets practically all of the requirements for community purposes. It is quite seldom that a community demands seating quarters for a greater number than this. The standard argument in favor of the larger assembly hall is the need for seating at graduation time. This seems to be a habit rather than a necessity. Commencement exercises are not necessarily most desirable when a larger group is present. The essential elements to be incorporated in an assembly hall are three in number. First, the acoustics should be perfect. This makes it possible for the student with ideas but limited voice to be heard. It also makes it possible to utilize the hall for classroom purposes, particularly, dramatics and music. Second, it should be an attractive, pleasant place to meet. Dull, uninviting quarters are not conducive to the easy, free development of ideas, which is one of the essentials in our social life, and which the school should foster. Third, the seating should be convenient and comfortable.

Offices

It may be stretching the definition of a special room to include the offices as such, but so much of the success of the school depends upon good planning of the central offices, that I have chosen to include it here. Good office planning requires the recognition of a few fundamental principles of office management. First, one must know the interrelationship of the agencies to be housed. The principal of any high school is a busy person. He should, for this reason, be able to reach any of his subordinates with a minimum of effort. This precludes the segregation of the office suite into separate units by spacious hallways or corridors. Second, the equipment of the office should provide ample storage space easily accessible for all materials to be distributed to the school. Storage of large quantities may be provided at some distance from the main office, but the office itself should contain space enough for current supply. Third, good lighting, good ventilation and heat which may be made available when the school itself is not in operation, fosters good administration. Fourth, school administration has rush seasons. Planning a room adjoining the offices, so that it becomes available for the temporary assistants during these rush seasons, is an easy matter. The planner of school buildings owes it to the school to give it an office where efficient management can be maintained. He owes it to the taxpayer to avoid undue expansion.

STANDARD ARRANGEMENTS OF SCHOOL CAFETERIAS

BY
A. E. MERRILL
EQUIPMENT ENGINEER

THE accompanying plans represent standard arrangements for school cafeterias, and were adapted from actual installations in the central portion of the United States, where probably the largest number of schools have been so equipped.

Number of Patrons. In determining the space that is required for the particular school, it is customary to assume that approximately 40 per cent of the total enrollment will avail themselves of cafeteria privileges. Furthermore, as this equipment is to be used but once a day, it is always advisable in the larger schools, where there are 1000 or more pupils, to divide them into two or more shifts. A logical division is to have the girls come in at one time and the boys come in at another.

Counters. Even with such a division, there will often be more than could be conveniently handled by the maximum service counter in one shift, and in such cases, the arrangement shown as Outfit "D" is doubled, and two or more identical service counters are installed, preferably paralleling the walls separating the dining room from the kitchen. If space does not permit of such an arrangement, these counters are arranged in horseshoes with two services to each such division, extending vertically from the kitchen wall into the dining room.

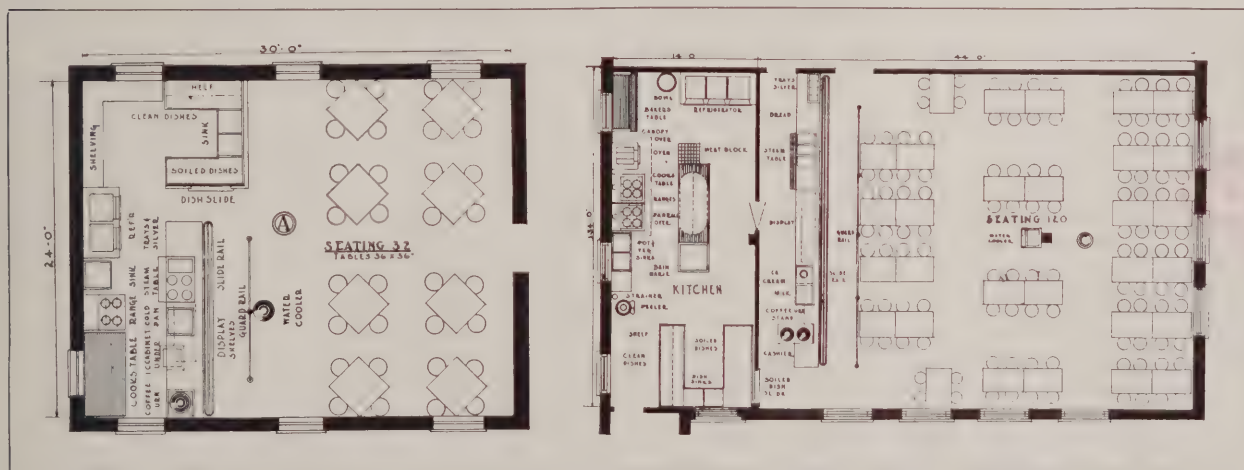
Pupils per Counter. Thus, taking an actual case as an example, a school of 1000 pupils, where at least 400 would be expected to use a cafeteria dining room, could be handled by one service counter and dining room, as shown in Outfit "D," providing the girls and boys used the room at different times. Whereas, if the school had an enrollment of from 1600 to 1800, it would be necessary to at least double this counter arrangement and seating capacity, even though the pupils were separated into divisions.

Time for Service. It has been found by experience that under normal conditions it is impossible to serve students more rapidly than at the rate of 12 or 13 per minute; consequently, if 200 pupils are to use a dining room at once, it would be approximately 15 minutes from the time the first was served until the last one had been taken care of.

Seating Capacity. In order that seats may be assured for all the pupils after they leave the counter, it would be necessary to have at least 175 chairs provided for this length of counter, and the extra seats on the plan "D" are for those who will bring their lunch and not require counter service.

Outfits. The various plans indicate different types of table arrangement. Outfit "A" shows 36-inch square tables, diagonally placed through the dining room, which gives more freedom of space than any other arrangement, but is more expensive in floor space required, as at least 14 square feet per seat is necessary. Outfit "C" used 30 x 48-inch tables, placed end to end, and this type of arrangement is most economical of space, as it requires 12 square feet or less per seat, including counter service.

Type of Equipment. In selecting the kitchen equipment and dining room equipment, a wide range of qualities are available, and in the summary which is given here it is a standard serviceable variety, which is not ornate or elaborate. These prices may be lowered by at least 25 per cent for the cheapest or may be doubled if a particularly fine place is desired. Galvanized iron sinks are included and, with the exception of Outfit "A," glass-top tables are used. Where a wooden-top table and bentwood chair are used, the tables and chairs together may be secured for as little as \$5.50 per seat, whereas when a glass-top table with a better grade of chair is se-



Plan, Outfit "A," Open Kitchen Type for
Smallest Cafeterias

Plan, Outfit "C," Kitchen Separated from
Serving Table



Open Kitchen Type, Similar to "A"
High School, Pelham, N. Y.



Cafeteria with Two Units Similar to "D"
High School, Asbury Park, N. J.

lected, the cost per seat may run as high as \$15 each.

Power Machinery. The use of power machinery is recommended in Outfits "C" and "D," including in the latter a vegetable peeler, mixing machine, meat chopper and dishwashing machine, all of which labor-saving devices are an economy in operation. If any of these were to be eliminated, the dishwasher should be the last to be considered, as for sterilizing purposes alone it is practically a necessity. Only those types using the overhead spray should be given consideration, the type in which the dishes are held in racks, over the washing tank.

Electric Refrigerators and Refrigeration. No electrical refrigeration is included in the cost summary, although this is specified in the majority of the larger installations, and it adds only about \$400 for each box of 75-cubic foot capacity or thereabouts. All refrigerators are figured with sheet cork insulation, and all boxes should be adaptable for the use of either ice or mechanical refrigeration.

COST ESTIMATES

Outfit "A," seating capacity of 32:

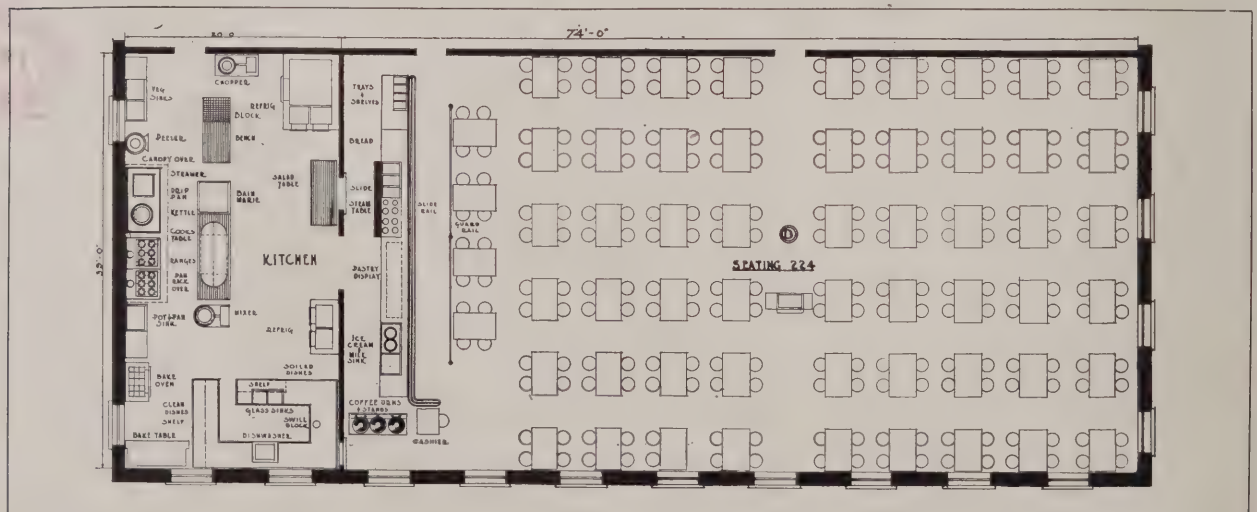
Serving Counter and Equipment.....	\$550
Cooking Department.....	410
Dishwashing	150
Tables and Chairs.....	220
Utensils and Trays.....	250
	\$1,580

Outfit "C," seating capacity of 120:

Serving Counter and Equipment.....	\$1,850
Cooking Department.....	1,650
Dishwashing	200
Tables and Chairs.....	1,500
Utensils and Trays.....	650
	\$5,850

Outfit "D," seating capacity of 224:

Serving Counter and Equipment.....	\$2,600
Cooking Department.....	4,000
Dishwashing	950
Tables and Chairs.....	2,600
Utensils and Trays.....	1,150
	\$11,300



Plan, Outfit "D," Efficient in Plan, Equipment and Arrangement

RECREATIONAL AND ATHLETIC FACILITIES IN SCHOOLS

BY

JOSEPH C. LLEWELLYN, ARCHITECT

THE part which recreation and athletics play in schools of the higher educational organizations of the country today, as compared with the same work in schools only a few years ago, forms an interesting topic. Not very many years ago, in order to get a gymnasium into a school building without a great deal of opposition, it was necessary to camouflage it as a playroom, recreation room, or something similar,—the word “gymnasium” being not wholly understood. But with the playroom actually provided, its use became more clearly understood; it was extended and supervised, and the gymnasium grew into being. Whether the facilities provided are used to the fullest advantage may be a topic for discussion, but it is certain that the activities in this field of school life can be made useful in promoting health, in building character, and enabling boys and girls to get on with their fellows in after life. The adaptation of recreation and athletics so as to build and maintain good health and good character is the part of and is in the hands of the nation's educators, and we believe they are equal to the responsibility. It is the work of the architect to provide the housing and facilities with which to do the work to the best advantage, and to do this work well he must acquaint himself with the educators' viewpoint as fully as possible.

In the limits of this article it is possible to give only an outline of the essential requirements, and that in terms of the average present-day school, such as is found in the smaller cities and community groups. Briefly, the topic can be divided into two general heads: 1st, provisions for indoor athletics, including the gymnasium and the necessary locker and shower rooms and other accessories, and the swimming pool; and 2nd, provision for outdoor athletics and recreation.

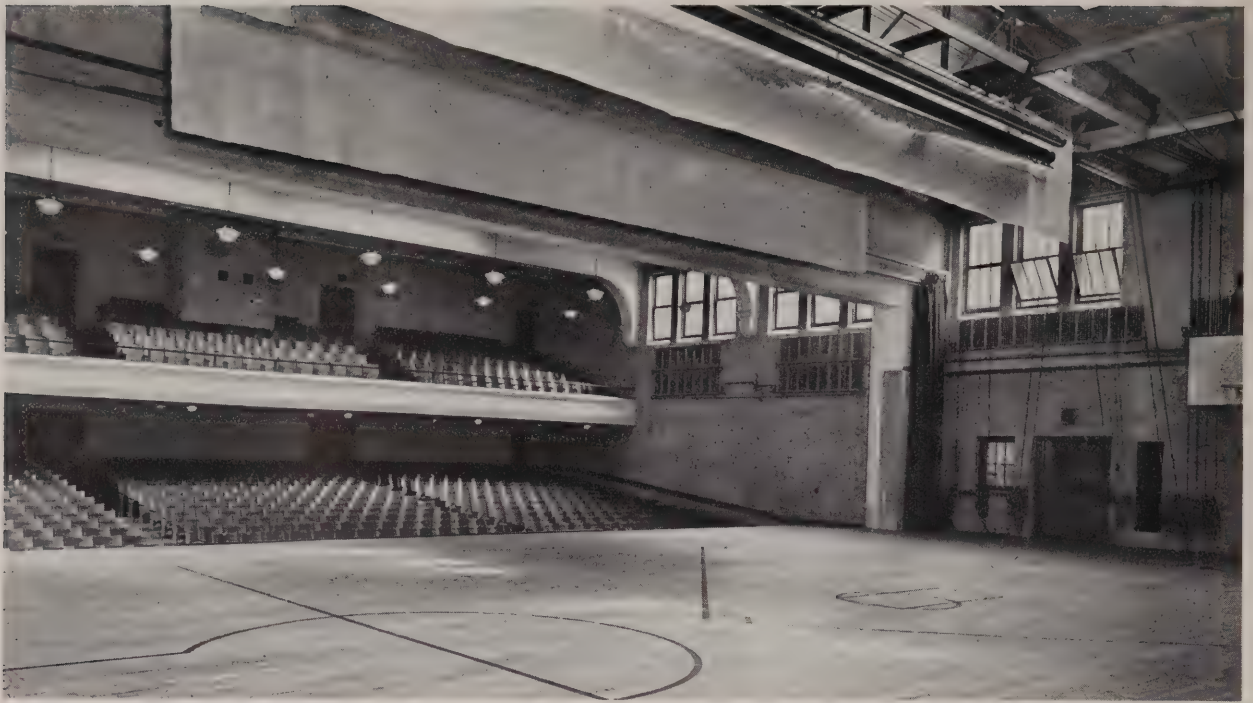
Originally, any rectangular room having a width of 40 to 50 feet, a length of 60 to 70 feet, and a height of 16 feet or more, would class as a gymnasium. Shower facilities were meager, seating space for the public absent or very small, running track and straightaways for the most part absent. Public interest grew, however, and facilities for witnessing the games became necessary. This necessity, together with the necessity of economy, led to the use of many plans looking to the double use of floor space, as, for instance, a corridor converted into a visitors' gallery by the installation of movable windows between the corridor and the gymnasium; the double use of the same floor space for an auditorium, when provided with movable chairs, and a gymnasium when chairs were removed,—a small stage being provided at one side of the room. These and similar arrangements have their drawbacks as they necessitate the use of removable chairs or bleachers.

The Stage-Gymnasium and the Auditorium. As athletics became popular the auditorium also came into more general demand, and the stage-gymnasium, in which the stage of the auditorium is enlarged to gymnasium proportions, with a proscenium practically the full width of the auditorium, came into use. The auditorium was provided with fixed seats, thus eliminating the storing and moving of chairs every time the occupancy changed, and it became possible to use both gymnasium and auditorium for different purposes at the same time. Improvement in the constructions of accordion doors of light construction and sound-resisting materials has made it possible to reduce to a very considerable degree any interference with the work of either gymnasium or auditorium by the other. The stage-gymnasium in conjunction with the auditorium having fixed seats is an economical arrangement for schools of medium size,—say of from 750 to 1,000 pupils,—and it is well liked by many who have used it, although the first reaction may have been one of opposition.

In large schools, and where funds are available, the arrangement will give way to a wholly separate auditorium and stage, and to separate gymnasiums for boys and girls. In some instances, the stage gymnasium is used by the girls and a separate gymnasium by the boys, the latter without bleachers or seating for the public, as all contests and athletic entertainments, exhibitions, drills, pageants, etc., are given on the stage-gymnasium. The tendency, however, is for larger gymnasiums and larger playing floors to permit more than one class to work at the same time and thus provide for growth in school enrollment; and to have permanent seating accommodations for an average audience, with movable bleachers for expansion upon special occasions.

Gymnasium Essentials. The essentials of a gymnasium are, 1st, a good floor, level, smooth and resilient; 2nd, smooth, hard walls for 10 to 12 feet above the floor and, above this wainscot, plaster quite porous to diminish sound reverberation; 3rd, sufficient height to accommodate the desired apparatus; 4th, permanent seats for average attendance at games, and provisions for caring for special occasions; 5th, shower and locker accommodations; 6th, good light and ventilation in gymnasiums, locker rooms and showers; 7th, other rooms such as coaches' offices, storeroom, workroom, special corrective gymnastic rooms, and rest room facilities for girls.

The floor for the majority of gymnasiums is maple, a serviceable floor when laid with proper care upon nailing strips supported on felt-lined screeds to give resiliency, with the nailing strips anchored to floor at intervals. Proper provision must be made for the expansion of the floor in damp weather. A fine playing floor is obtained by using blocks of yellow



Stage, Combined Gymnasium and Auditorium, Community High School, Dundee, Ill.

Joseph C. Llewellyn Co., Architects

pine on end, glued to strips, then grooved and splined, and secured to nailing strips brought to true level. Wood floors should be sanded and treated with penetrating oil, placed with mop and left to penetrate the wood. Floors of short wood, laid herringbone or in small squares in mastic and sanded and treated as before, have been used in a limited way. Also a mastic top on a $\frac{3}{4}$ -inch base of asphaltic concrete has come into use. It has the advantage of neither shrinking nor swelling, is easily repaired,

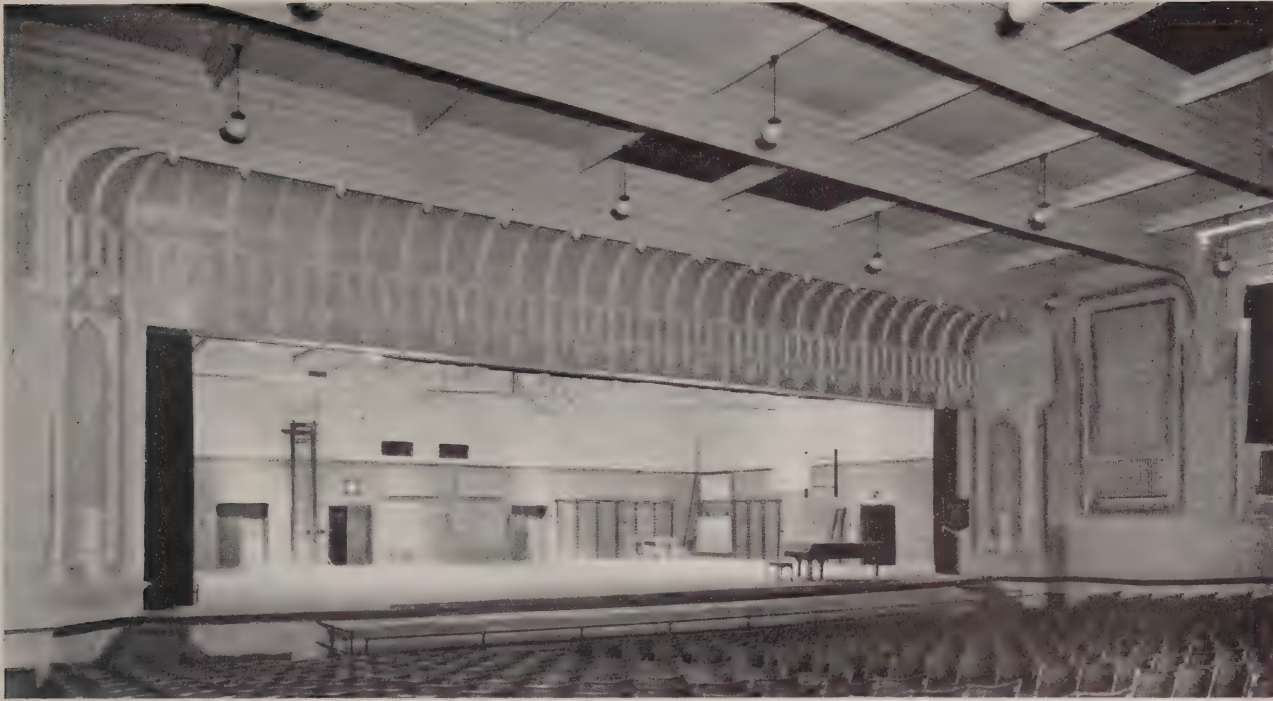
and, in the case of basement gymnasiums especially, is well worth considering.

Walls of smooth, impervious, matt finish face brick laid with smooth flush joints for a wainscot 10 or 12 feet high will resist wear and tear. The ceiling should be covered with a sound-absorbing material. Heights of rooms will be governed by conditions, and must be sufficient to care for all suspended apparatus (usually 22 to 24 feet), and to provide clearance for running track, when installed, so as not to



Boys' Gymnasium, High School, Mount Clemens, Mich.

Joseph C. Llewellyn Co., Architects



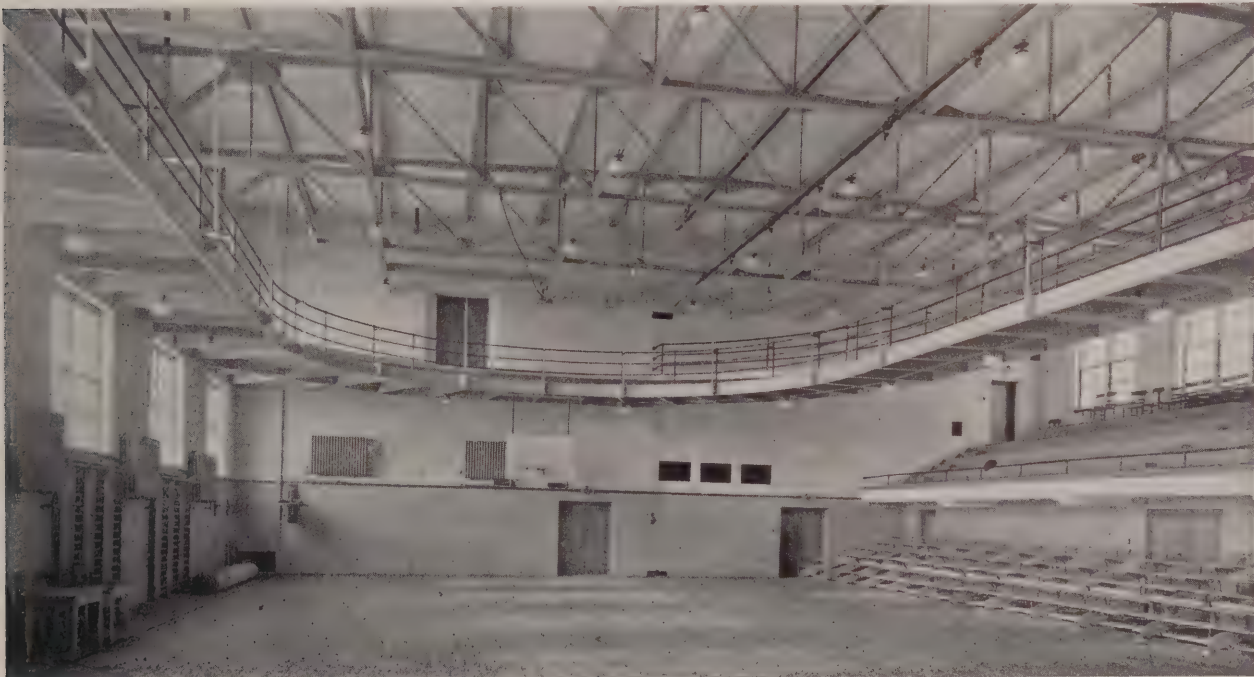
Stage, Girls' Gymnasium, Benjamin Bosse High School, Evansville, Ind.

Joseph C. Llewellyn Co., Architects

interfere with a full use of the entire floor area. For the bleachers, sight lines should be well considered. The fronts of the permanent bleachers should be as near to the floor as possible to permit of good view of practically the full playing floor, but high enough to permit of three or four rows of portable bleacher seats. Concrete construction, smooth finish, painted or chemically treated, forms a good base for seats made of 2 x 4-inch cypress or quarter-sawn yellow pine strips, shaped to proper

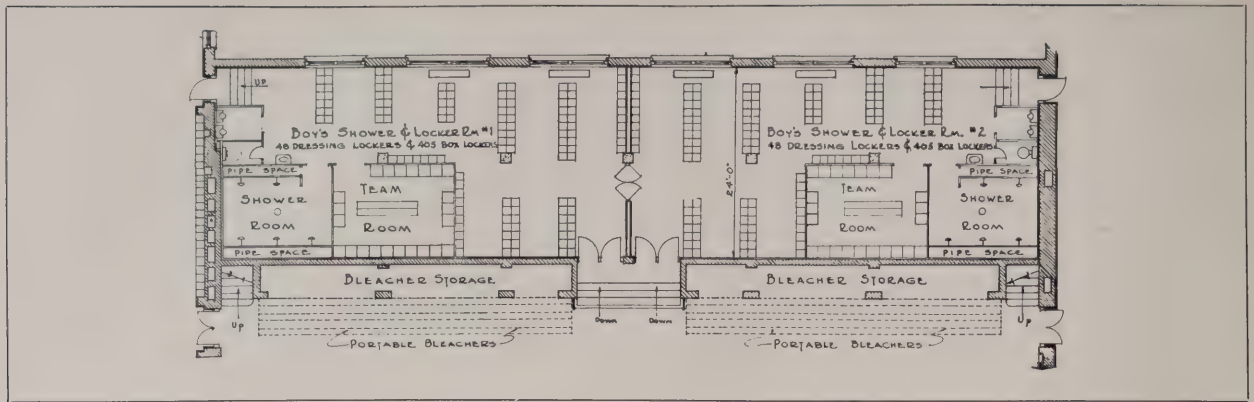
section and secured to blocks to give required height, and well bolted to concrete.

Running tracks are less common now than formerly in the smaller gymnasiums. For large schools, the coaches want them. The construction must be able to carry the standard floor load, for while they should not be used for spectators, they often are so used, regardless of their inconvenience. The floor of the running track must be carefully planned with proper banking at all turns, and laid with narrow



Boys' Gymnasium, Lyons Township High School, La Grange, Ind.

Joseph C. Llewellyn Co., Architects



Twin Locker Rooms, Lyons Township High School

Joseph C. Llewellyn Co., Architects

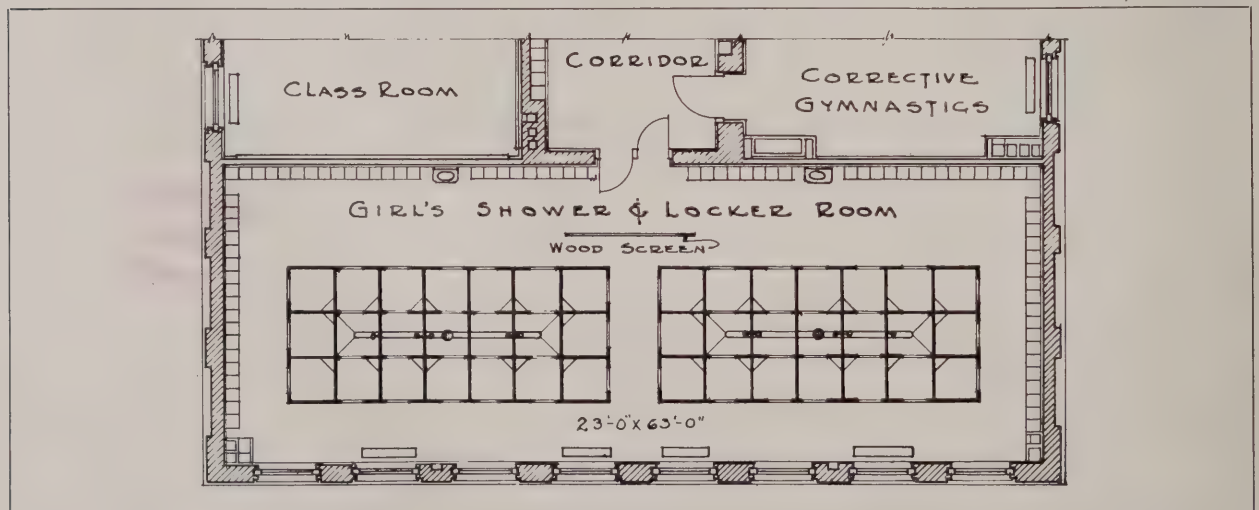
flooring which will take the bending. It must be thoroughly nailed and dressed smooth, and finished with cork carpet or similar material well glued to the wood. Straightaways in schools are not common, though often desirable. However, opportunity offers at times in large schools to use a rear corridor adjoining the gymnasium as a straightaway by providing a suitable resilient floor.

Shower and Locker Rooms. The structure of shower stalls and floors, and materials used to secure impervious divisions and walls, the treatment of walls, lighting and ventilation, all call for care and close attention. Careful planning is required to secure maximum locker facilities without crowding, to care for pupils and for home and visiting teams,—to give each the desired accommodation. For the larger schools, twin locker rooms, having shower, team and toilet rooms, make a convenient arrangement. (See page 438). In inter-school games the visitors occupy one room, the home team the other.

Various materials can be used for shower stalls. Built-up stalls of monolithic terrazzo on steel and metal cores built into the floors and ground to a smooth surface and polished, are of attractive ap-

pearance and are economical. In girls' locker rooms, dressing stalls are provided under various arrangements, varying from one dressing room to three to each shower. Some large schools, after experimenting, have adopted two dressing rooms to one shower as the best proportion, taking into consideration the time required to change classes. The size of classes determines the number of showers and dressing rooms. The average size of shower stalls is 3 feet to 3 feet, 4 inches in width and 3 feet, 6 inches in depth. A triangular locker in each girl's dressing stall permits the use of box lockers only in the locker room and is economical of space. A small mirror in each dressing room avoids crowding before general mirrors at the end of class periods.

Accessories for gymnasium and shower rooms,—such as wall drinking fountains and cuspidors in gymnasiums,—located so as not to interfere with play,—add materially to the comfort of the pupils. Mechanical means of drying hands and for hair drying are sometimes used. Their success depends on the way they are used and the care in maintenance. Ventilation of gymnasiums and locker rooms should be carefully considered. Warm air, blown into the



Girls' Shower and Locker Room, Francis Joseph Reitz High School

Joseph C. Llewellyn Co., Architects



Pool, Mount Clemens High School

Joseph C. Llewellyn Co., Architects
Plan Below

Pool, Junior High School, Trenton, N. J.

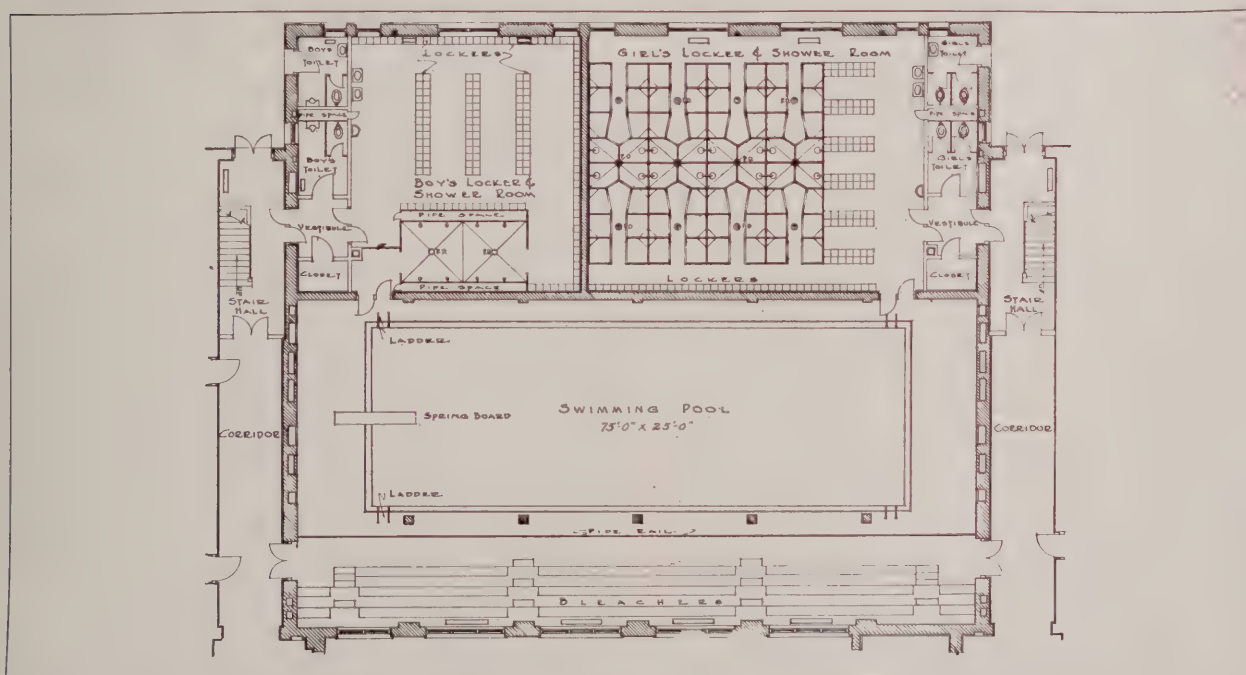
Ernest Sibley and Lawrence C. Licht, Architects; J. Osborne Hunt
Associated

locker rooms and mechanically exhausted, will aid in maintaining dry rooms. It is desirable to locate shower rooms so that plenty of light and sunshine can be had if possible. Without warmth and good ventilation, shower room walls and ceilings will condense moisture and produce in time more or less disintegration of wall surfaces.

Swimming Pools. Where swimming pools are used, it is desirable to plan them *en suite* with the gymnasiums so that the same locker rooms and showers can serve both and so avoid duplication. Overhead light with lifting skylights, where possible, gives considerable flexibility to the ventilation of these rooms. Insulation of roofs over pools will be a material help, and care in selection of wall and ceiling finish is necessary. The building of the pool itself is not necessarily an expensive operation. If money is limited, a substantial pool can be constructed

with a concrete pan reinforced horizontally and crosswise and waterproofed with integral waterproofing. It can be lined with a bottom of white vitreous tile, sides being of white tile or terrazzo waterproofed; terrazzo gutter and rail, with markings of inlaid tile. This gives a clean, sanitary, and quite satisfactory pool. The floors of pool room can be terrazzo with a mixture to prevent slipping. The room can be finished at a reasonable cost with smooth, light gray or buff impervious brick for walls, and cement plaster, properly painted, for the ceiling. Enameled brick, tile, or terrazzo make attractive walls at a somewhat higher cost.

Water purification in addition to filtering can be by use of chlorination, ozone, or violet ray. Each has its advocates; chlorination by mechanical means furnishes a simple and economical means. Much depends on the proper sizing of supply and circula-



Plan of Swimming Pool and Locker Rooms, Mount Clemens High School

Joseph C. Llewellyn Co., Architects



Stadium, Enlow Field, Evansville, Ind.

Joseph C. Llewellyn Co., Architects



Stadium, Oak Park, Ill.

Joseph C. Llewellyn Co., Architects

tion piping. Often pipe sizes are too small, causing sluggish circulation. Filters, heaters, and piping to recirculate in eight hours at least are desirable.

In schools of from 750 to 1,000 pupils, coaches for boys are provided with one or two rooms, shower, and storeroom; and the physical directors for girls are given two or three small rooms for offices and workrooms and a rest room for the girls. In larger schools, these suites will expand somewhat to provide a room for corrective gymnastics or exercises for boys, and the rest room facilities for girls will be enlarged to meet the larger enrollment. For the larger schools, also, boys and girls will have their separate gymnasiums and in many schools separate swimming pools. The size of the school, its possible future growth, and the financial capacity of the school district are determining factors in planning the recreational facilities for schools. Provision should be made for maximum classes in the gymnasiums, in case of rapidly growing districts, by making larger floors than needed at first and providing for expansion of locker facilities as required. Provision for expansion of space for special work or rest room requirements can easily be taken care of and should always be kept in mind in planning.

In the foregoing paragraphs, the high school has been primarily in mind, but the trend of education today recognizes the value of work and play and is making use of them in elementary schools as well. The architect must incorporate in his elementary buildings the auditorium and the gymnasium with their accessories. The school building is also becoming more than a school for children and is a community asset as well, as the public uses various parts, especially the auditorium, gymnasium, swimming pool and possibly the library. The auditorium or gymnasium can be made accessible and separated from the rest of the school as occasion demands.

The Athletic Field. The chief of outdoor features is the athletic field. The laying out of an athletic field is pretty well established as to necessary size and shape of ground required for the various games. What is not always cared for as it should be is the preparation of the field to give proper drainage,

treatment of soil to properly prepare it for seeding, and the foundations for track and straightaways. These require care, not in the preparation and seeding alone, but in the use of the field itself, until a turf is grown and track is brought to a proper condition. This work is in the province of a landscape architect familiar with the locality in laying out drainage and seeding, and it is the work of the gardener to properly maintain it; in the hands of careful and capable men, it can be made of moderate cost when its benefits are taken into account. To preserve the field in condition for school athletics, it should be enclosed. Enclosure can be made by use of woven wire and steel posts, or by brick or concrete walls. The type used will usually be determined by the location of the school, by cost and the ability to pay for it. The enclosure simplifies control in all inter-scholastic games in the open air.

Outdoor games, as well as indoor, draw crowds, provision for which brings up the matter of permanent seating for the public to take the place of portable or wooden bleachers. These *stadia* are of various forms from the built-up banks of earth, faced with steps of wood or flat building stone and concrete, to those of wholly concrete construction (open or covered) and faced with brick walls to make a shelter as well as to provide seats. The concrete construction, covered or not, permits of providing various facilities for the comfort of the public which earlier forms of seating do not, and which are essential.

In conclusion, school athletics and recreational activities constitute one large element in creating and maintaining school spirit and in building up school traditions, in teaching young men and women to do team work and, in doing team work, to concentrate attention on the thing to be done; to think and act quickly when necessary; to be one with one's fellows,—all qualities quite essential in after life. To plan for the requirements of athletics and recreation in our schools and give the buildings all flexibility possible in providing for the present and anticipating the future is, as was said in the beginning, an interesting thing to do. It cannot be done in a haphazard way but calls for all the care and attention possible.

DETAILS OF SCHOOL BUILDINGS

BY

WALTER H. KILHAM

OF KILHAM, HOPKINS & GREELEY, ARCHITECTS

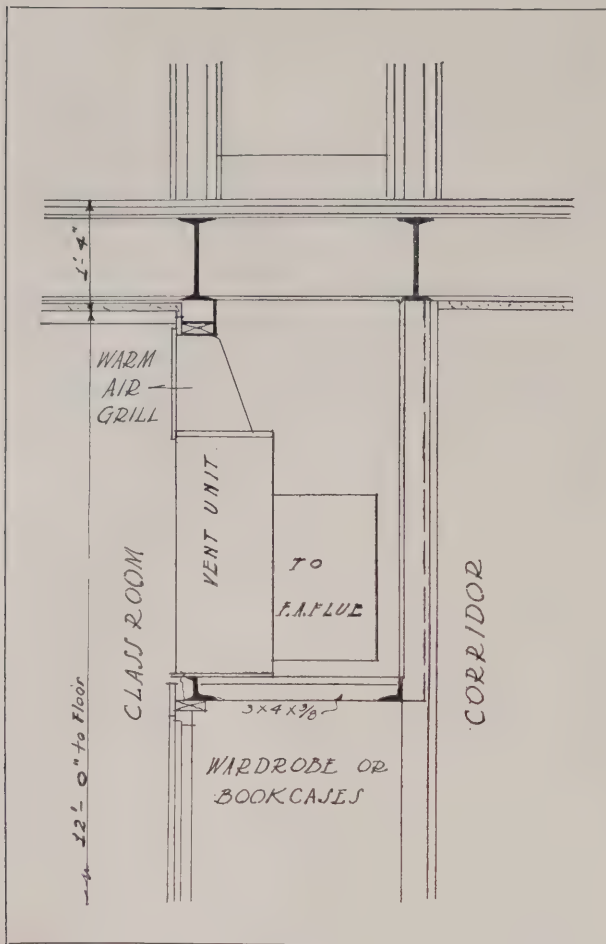
UNDER the liberal appropriations of what the next generation may refer to as the "frenzied twenties," American schoolhouses have been developed to an astonishing degree, and while the proportion of cubic space devoted to education still remains an appropriate factor, sizes of rooms more particularly destined for athletics, amusement and times of general enthusiasm have increased by leaps and bounds, so that the planning of what might be called the "country club" type of building has come to absorb much attention from present-day architects, sometimes to the detriment of carefully thought out details. Happily the age of Romanesque monastery windows, guaranteed to exclude light from classrooms, has passed, as has the period when English hammer-beam trusses carefully constructed of plaster were considered the prime essentials for a good school auditorium; but careless or ill-considered interior details still often mar (or at least it seems so to the practiced eye) the effect of many a near-sumptuous high school. This article will consider a few of the many items which must come under the care of the schoolhouse architect and sooner or later call for prompt decision. Experience has been defined as something everyone gets when it is too late to use it; if some of these suggestions arrive in time to be helpful, the effort will not have been made in vain. As many features of schoolhouse detailing have been previously considered at length, the main discussion in this article will relate to developments in material and design which have come about since the war.

The Classroom. No matter how many accessories the modern schoolhouse may have accumulated, the classroom still remains the predominant feature, and its main attributes do not undergo many changes. The average size for 35 pupils of the sixth grade to high school remains at 22 x 30 feet, which accommodates five rows of desks across and seven rows deep, with a 3-foot wall aisle, four 18-inch interior aisles, and a blackboard aisle of 3 feet, counting the desks as 24 inches wide. The whole width then totals 22 feet, not too much for the inner part to receive a fair amount of light, but still not down to the standard of the future, which will some day reduce it to four rows or maybe 18 feet, when standard classes shall have been reduced to 28 or 30 pupils.

Windows. The standard window space remains at the empirical figure of 20 per cent of the floor area, which seems to be as much as can generally be obtained, considering the difficulties of wall and window frame construction and the heights of window radiators; and if the light is not affected by lowering shades, it is fairly satisfactory on bright days. The future may see a general adoption of some form of white "blackboard" which would ma-

terially reduce the absorption of light. The difficulties of wall construction, as far as they relate to wide window spaces, are largely overcome in steel or concrete frame construction, but the average rural or suburban schoolhouse is still far from being of that type, and depends on wall-bearing brickwork for its main supports. A certain amount of pier space along the 30-foot length of the room is therefore necessary, and the architect, while holding these piers down to the least width compatible with strength, has to see to it that they are not so wide as to cast any troublesome shadows.

The sashes themselves, which for the present may be considered as of wood, should also be kept reasonably narrow for ease in operation. If made over 4 feet, 6 inches or 5 feet wide they become unduly heavy, requiring larger weights and stronger frames, and are weak unless made with a liberal amount of woodwork. A good arrangement from the sash manufacturer's point of view is that of three pairs of double windows for each room, providing it does not interfere with the exterior architectural design. Three pairs of such windows, each about 3 feet, 6 inches x 9 feet will fulfill all the legal requirements for a room 22 x 30, and all the sashes will fall within comfortable sizes for glass, cords, weights and woodwork, and will be free from any tendency to stick. The question of "double-hung" versus tilting windows still remains open. Both types have warm friends and vigorous enemies, though the friends of the tilting type are very positive and numerous among the teachers,—who usually like the larger quantities of fresh air which they can thus secure in defiance of the heating engineer's calculations. Local ventilating units, locally controlled, by which the supply of pre-heated air can be shut off when it is desired to open the windows, are being installed in many schools. Their use obviates the long runs of warm air ducts of central systems and reduces cubage factors, which appeals to most architects, while teachers welcome the possibility of room control over the vexing matter of ventilation, a privilege which is not, however, very freely granted to them as yet. The objection to this type of ventilation is that it is dependent entirely on the ideas, whims and control of the teachers, who may or may not understand ventilating needs. As what constitutes proper ventilation is a moot question, which is considered in a separate article, we mention here only the space saving that attends the use of the local ventilating units. The whole unit apparatus is contained in a neat steel casing of unobjectionable appearance as far as its design is concerned, but it constitutes a certain obstacle if placed in the window aisle. This location is the most favorable from the point of view of economy, as no long runs of sheet



Sectional Diagram of Unit Vent Shown on Opposite Page
Kilham, Hopkins & Greeley, Architects

metal ducts are required to reach the outer air, but various efforts have been made to remove the unit from the room and to place it in a less conspicuous location. One of these sketches shows an arrangement designed by the writer for the James Russell Lowell School at Watertown, Mass., which places the unit in the space ordinarily wasted above the tops of the "Chicago" wardrobes, thus releasing the floor space and clearing the window aisles. A slight increase in cost, hardly appreciable in the total for the building, is caused by the short runs of galvanized duct between the unit and the outer walls.

Blackboards and Tack Boards. Still another development seems to be the growing encroachment of the tack board on the time-honored blackboard space. Many teachers ask for as much as 50 per cent tack board space, going the full width of the blackboard, while others, generally those in the lower grades, want a cork carpet border about a foot wide going all around on top of the blackboard, which is reduced in height for this purpose; still others eschew the cork carpet and demand a board of soft pine or whitewood into which thumb-tacks can be easily pushed, leaving their marks, however, behind. There are ingenious devices available that provide easy means of hanging drawings and other exhibits without marring or danger of falling. Whichever fashion

prevails, it is a useful practice to provide an instrument board near the door on which the switches, telephones, thermostats, etc., can be mounted,—that is, providing the electrician can be induced to forego his insatiable desire to put these contraptions in the center of the best wall space in the room.

Blackboards. Blackboards should never, of course, be placed on the window side, and as much space as possible should be saved for them along the inner wall and behind the teacher. A good general rule for heights of chalk troughs above floors is:

2' 2" from the floor in kindergarten.

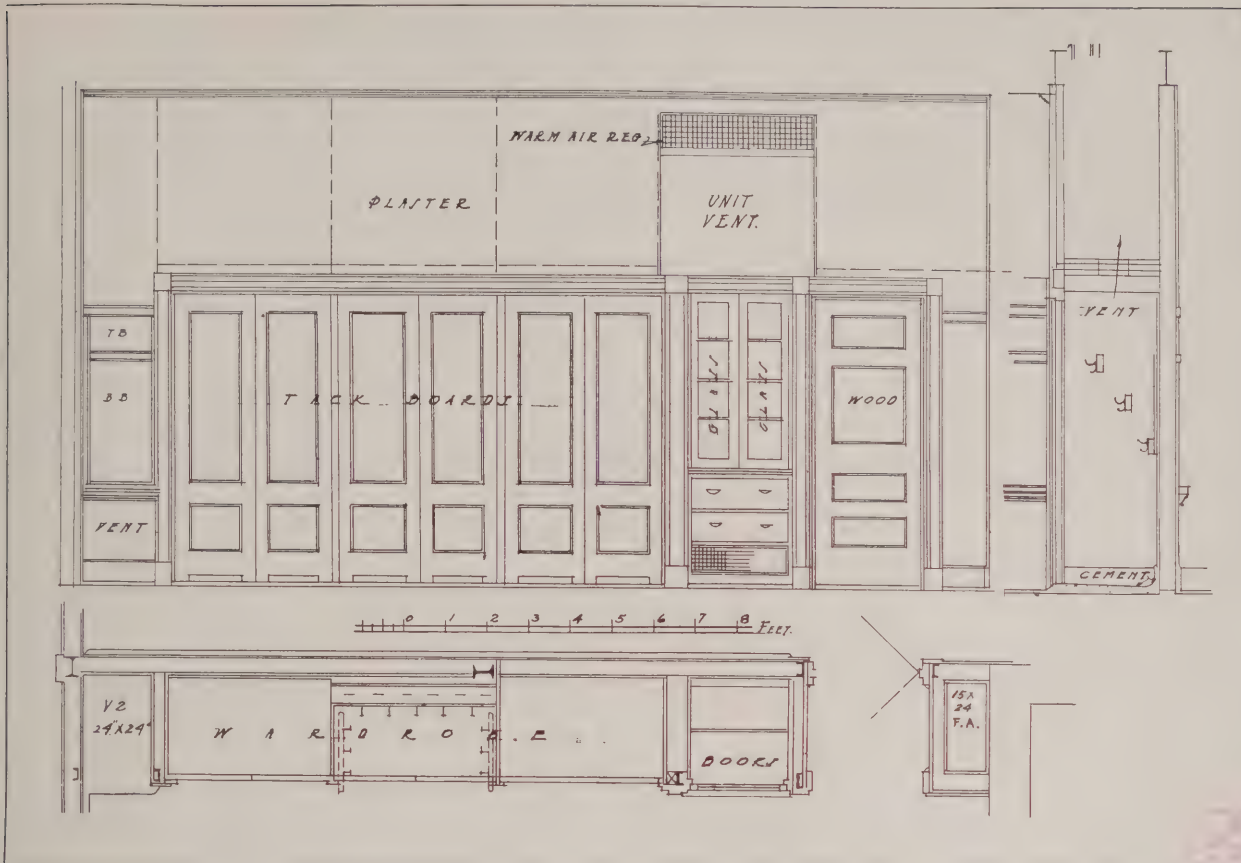
2' 4" to 2' 6" from floor in grade IV.

2' 8" from floor in grades V to VIII.

2' 8" to 2' 10" from floor in high schools.

Screens for erasers above the chalk rail are not generally regarded as being standard equipment, but they are occasionally demanded. They should be of light but strong construction. The ideal, of course, would be a type supported from the back on brackets, so that the troughs could be wiped out with a continuous motion of the hand, but in practice some front supports are necessary.

Wardrobes. In grades below the senior high, the "Chicago" type of wardrobe, integral with the classroom, seems to have found great favor with school authorities on account of its convenience, and with architects on account of its saving of cubage, though probably no one would attempt to say that it is superior to the old separate coat room, especially if the latter is provided with an outside window on the sunny side of the building. Others like placing lockers or wardrobes along the corridor walls, an arrangement more suitable for high schools than the lower grades. The "Chicago" wardrobe saves cubic and square foot space, but it causes loss of a lot of blackboard space, unless it is placed at the rear end of the room opposite the teacher, which should, of course, always be done, but which is not always economical. The most difficult problem about it, after its location is settled, is that of the doors. Shall the doors be hung with weights and slide up and down, or shall they fold back into the wardrobe, or shall they pull down in roller-slat fashion? If they slide up like windows, the long frames and weight boxes are rather a disfigurement to the room, though space is certainly saved. If the doors are mounted on any of the clever folding hardware devices, each is likely to require a little of the length of the wardrobe for folding back, space which may be sorely needed for hook space in case the wardrobe shares the narrow end of the room with a bookcase, a communicating door, and the heat and vent ducts. Details included here show methods of constructing both of these types in recent buildings. The wardrobe may well have a cement floor with a coved base, raised an inch above the classroom floor at the front with a bevel and sloped back to prevent water from umbrellas or wet clothing running out on the classroom floor, and it should have a 6- or 8-inch vent connection in the top and suitable air intakes with



Detail of Wardrobes, Cases, Heating and Ventilating
James Russell Lowell School, Watertown, Mass.
Kilham, Hopkins & Greeley, Architects

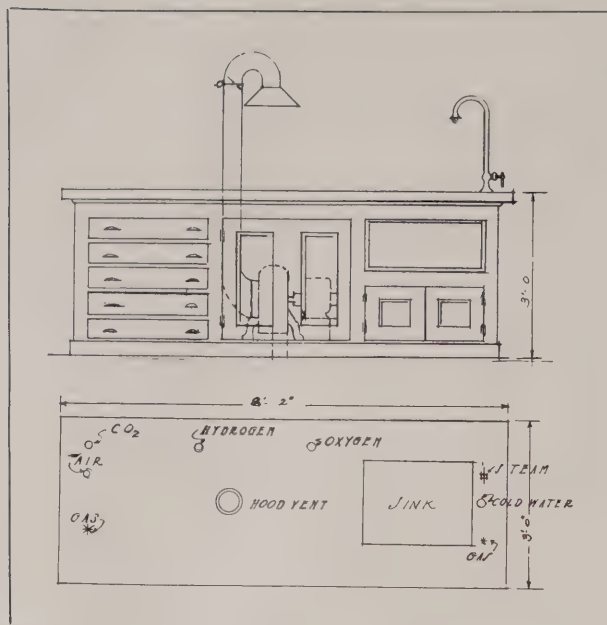
doors at the floor, so that the draft will always be *into* the wardrobe from the room. The racks for coat and hat hooks may be either poles on metal brackets or flat 1x4-inch strips on wood or metal frames. The flat type has the advantage of never slipping and being adapted to stenciling numbers, should this be desired.

General Trim. This should be of simple design, without elaborate mouldings or sharp edges which could readily be injured. Architraves are desirable around doors, to prevent injuring the plaster, but they may be omitted at the windows if plaster jambs are substituted with corner guards, if the committee really wants to reduce upkeep costs in the future. Slate or artificial stone is a good substitute for wood window stools to prevent the deterioration of wood where exposed to water of condensation, strong sun and perhaps rain beating in if the window is open. On the whole, some architects think block trim more practical than mitered. Transoms over doors are usually unnecessary. Steel trim of course demands consideration for each project, but a form of substantially enameled base is wanted, as paint quickly disappears from the ordinary steel base when the floor is subjected to mopping. Bookcases are essential, but their type has undergone little change.

Stairs and Corridors. Here again the advent of

battleship linoleum, cork and plastic floors has changed the scene and effected an enormous reduction in the amount of noise. The use of fabric flooring has done away with the old terrazzo cracks which always appeared to greet the critical visitor right inside the main entrance. The corridor dado needs to have eminently wear-resisting qualities, and can be made of tiling or salt-glazed brick in the more "Ritzzy" type of buildings, or of plaster covered with cloth in plainer structures; but only a confirmed optimist will build them of that material hopefully termed "hard plaster" without protective covering.

A considerable variety of materials is now offered for stair treads. Steel pans filled with cement, asphalt, terrazzo, non-slip abrasive tiles, linoleum and many other products are available, as well as blue stone, slate, etc. A steel non-slip nosing is a guarantee against undue wear. Some schools have had wooden treads thus fortified go through over 25 years of hard usage without perceptible damage. Different states have various rules for the height of the balustrade, but in any case a handrail at the usual height on *both* sides of the run is essential. Some states even require a 5-foot balustrade. Careful checking up of local regulations in this respect is necessary. The balustrade, if of iron, should be of simple type, and consist mainly of vertical mem-



Demonstration Table

Alexander Hamilton Junior High School, Elizabeth, N. J.
Kilham, Hopkins & Greeley, Architects

bers for easy cleaning. In some cities solid balustrades are preferred to prevent objects' dropping through. The nature and characteristics of the stair well or tower also need thorough study. So many fires have gained headway by shooting up the stair wells that it seems that enclosing the platforms at each floor with self-closing fireproof doors should be universal practice, even though it is not always obligatory. These doors and the partitions which contain them are generally made of kalameined wood, which is neat in appearance and sufficiently fire-resisting. The panels and transoms are filled with wired glass to transmit light from the outer windows, that in the door being clear wire-glass. The "smoke doors" so called, should open toward the stairs and should preferably consist of one pair without a central bar, so as to direct the stream of pupils toward the downward flight. The hardware should consist only of self-closing door checks, butts, pulls, and push and kick plates. Floor stops, hooks, or other attachments for holding doors open should be omitted, in spite of the tearful protests often received from the teachers, for such accessories defeat the primary object of the doors, which is to provide constant protection against smoke or flame in the stair wells by closing off any up-draft of air. Massachusetts and some other states require that the outer corners of the well be rounded on a 2-foot radius or cut off with a diagonal corner of equal size, to prevent wedging of small pupils in the corners in case of panic; and all landing radiators should be either recessed in the walls or hung on the walls above head height. Where gas is available, emergency gas lights are also desirable; and the electric lights for stairs should be carried on separate circuits controlled from the principal's office as well as locally.

Even in buildings of second class construction the stair wells should be absolutely fireproof, and the best wall material, in the opinion of some architects, is glazed or salt-glazed brick, which is durable, cleanly and does not require painting. The stairs when practicable should be located at the ends of corridors, so that light from the stair windows will shine through the smoke partitions and along the corridors. Stair towers should not be more than 125 feet apart. Some states allow, and others forbid, by-passes through schoolrooms with communicating doors, so the architect has little option in this respect, and he can best serve the community by insisting on plenty of stairways, easily accessible. The riser and tread sizes are also subject to public regulation and should be kept at a comfortable proportion, for obvious reasons. Closets should never be constructed beneath stairways, under any conditions.

Toilets. The science of sanitation in this respect is well advanced; in fact, in the opinion of many foreign writers the character of American civilization is expressed in our plumbing, and the matter of designing toilet rooms for its accommodation is not less well developed. The architect will, however, have to decide upon the materials with which the floors, walls, and partitions are to be constructed. It should be said that the essential requirements are first, light, which shows up dirt; and second, ease of cleaning. To this end a light colored floor is most desirable, even though it keeps the janitor busy mopping up, for a black floor absorbs light, conceals dirt and is always unattractive. White vitreous tile or mosaic, perhaps with black dots or pattern, and white glazed tile dadoes are none too good for the purpose. For toilet partitions, marble or some of the white products are ideal, but costly. Slate has the disadvantage of absorbing light and being easily marked. Enameled steel is in quite general use, but wood doors are sometimes preferable to steel doors, as they are less noisy and easier to adjust when a measurement goes wrong.

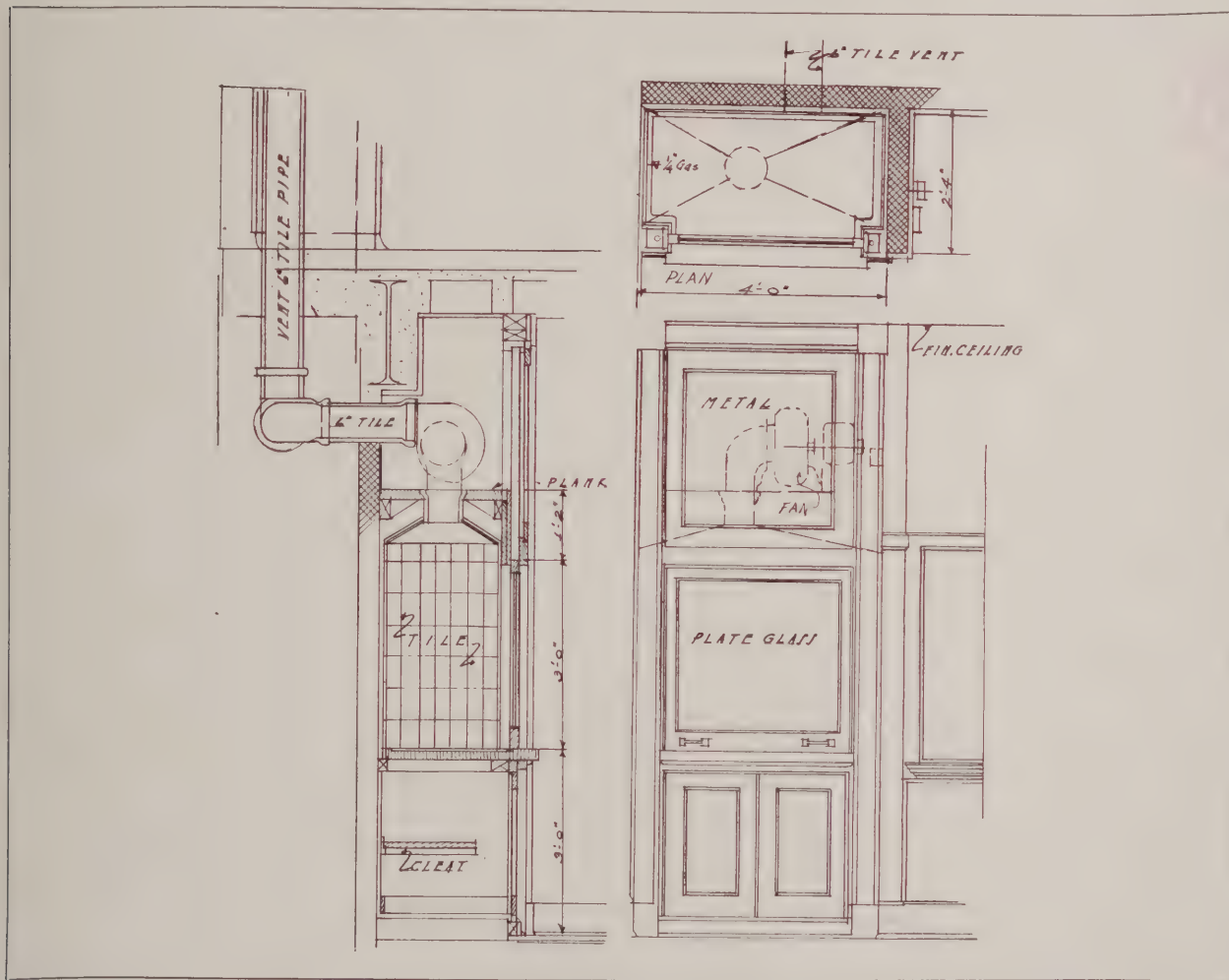
A technical discussion of various types of plumbing fixtures would occupy more space than is afforded by the limits of this article and is more adequately treated elsewhere in this issue of THE FORUM. In passing, one might question the use of expensive individual vitreous china basins for hand washing, when a good white enameled sink provided with plenty of faucets where the hands may be washed under running water might serve the purpose far better and actually be in closer accord with modern ideas of cleanliness. The single basin, seldom cleaned, with self-closing cocks which limit the supply of water, while pleasing in appearance, is often more of an obstacle than a help to personal cleanliness. Some sort of screens, or deflected passages to toilet rooms from corridors are thought necessary by educators.

Museum Cases. A good many schools gradually acquire specimens of minerals and all sorts of natural history or other exhibits, not to mention athletic

cups and trophies, for which no suitable place is provided. It is often easy to provide cases which can be snuggled into spaces around the heat and vent ducts, with glazed doors opening on the corridors where such objects can be properly displayed. Most cases should be white inside, and if the matter is of sufficient interest, may even be provided with lights.

The Kindergarten. The consensus of opinion requires that this room shall have a full southern exposure so as to obtain all the beneficial effect of floods of sunlight. This is mentioned somewhat guardedly, as the writer was recently a dissenting member of a jury of A. I. A. architects which awarded a competition to a plan which placed the kindergarten on the north side, mainly on account of an artistically drawn lilac bush placed in front of it by the skillful renderer. The program forbade any accessories! Having been then over-ruled on this point by prominent members of the profession, he is still a little timid about it, but continues to cherish the notion that the south side is best. The kindergarten should have its own separate entrance and, if possible, a level and sunny playground, even

with the door sill, so that the juniors will not have to be helped up and down steps when they go out to take the air. Their coat room should be of a size which will allow a bench for the attendant to use when putting on their rubbers and arctics and buttoning them into their what-alls. The toilet, which should be of an extreme handiness to the main room, will need special low-height fixtures and plenty of light. As considerable time will be spent by the pupils on the floor, that detail of a kindergarten requires special consideration. The ideal material would be something warm, or at least not too much of a heat conductor, which is at the same time easily cleaned,—cork, either tile or carpet, or one of the new rubber fabric floors seems to fill the bill as well as anything. Some regard cork carpet as not being susceptible of easy cleaning, but it has been successfully used in a good many kindergartens and is warmer than linoleum. The fittings of a kindergarten will vary according to individual wishes, but will generally include boxes and compartments for blocks and playthings, a large amount of tackboard space, and probably a small amount of blackboard.



Hood in Science Room
Alexander Hamilton Junior High School, Elizabeth, N. J.
Kilham, Hopkins & Greeley, Architects

The larger and smaller rooms which usually constitute the kindergarten suite are sometimes separated by rolling or accordion doors, to allow them to be easily thrown together. Custom seems to decree that the kindergarten should have a fireplace, but committees seldom appropriate money to buy wood, so its bricks often retain their virgin cleanliness for generations, unmellowed by smoke. However, an inglenook with seats looks well, and sometimes there is a gift of firewood, so that a fire is actually started. For this reason it is always well for the architect to see that a practical flue is constructed, which does not end in an air duct! Bay windows and other attractive features are appropriate for this part of the building and are sure to be appreciated.

The Auditorium. It must be said that the type of school auditoriums seems to be passing through a transitional stage. For large schools of 1,000 to 2,000 pupils the effort has heretofore been directed toward providing an auditorium capable of seating the entire membership at once. The expense of building such rooms as these, as well as their somewhat unwieldy sizes, has led to the consideration of the suitability of smaller types. If, for example, a two-platoon school of 1,500 were equipped with an auditorium for 750, the costly overhanging balcony could be omitted and the entire number comfortably seated on a rising floor with every occupant in full view of the others and not hidden by balconies. For the construction of such a room the general specifications for a theater minus the expensive decorative effects, could well be followed. Every effort should be made to assure good acoustics. Fortunately, several commercial systems of treatment for the walls and ceilings are available, and they can be trusted to produce reasonably good results. Upholstered seats will help, and linoleum or fabric for the aisles, if not for the entire floor, is desirable to minimize the noise made by persons entering and leaving. A form of wainscoting, for which purpose there is really nothing much better than wood, is necessary to protect the walls from hard usage, and no projecting radiators should be tolerated. An auditorium, however, differs from a theater in that it usually has windows for day lighting, and means must be provided for excluding light when it is desired to give picture exhibitions. This may be accomplished by means of opaque rolling shades, running in grooves at the sides of the windows, or by heavy draw curtains, which are simpler and perhaps fully as good, as well as being more decorative. The windows themselves will require some thought, as the sashes should not be too large and heavy, and provision must be made for cleaning them.

Some schools wish completely equipped theatrical stages, with switchboards, fly galleries, smoke ventilators and even grids. Such halls will probably also want sunken musicians' pits and complete dressing room layouts. It is difficult to know just where to draw the line in these cases. Good school shows can be put on with very modest equipment, and if

modern ideas of stage lighting effects are followed, the expensive borders and drops can be omitted. In any case, the architect must remember that his stage problem is four-fold, for he must provide facilities for (a) a single speaker with perhaps a few persons in chairs to form an *entourage*; (b) provision for a class of maybe 100 or 200 for graduations, or producing cantatas; (c) accommodation for a dramatic production, either by the students or by a regular troupe, professional or amateur; and (d) facilities for showing motion pictures. To fulfill all these requirements and satisfy everyone will require ingenuity and some tact. A "cyclorama" of velours provides a good background for the single speaker and closes off the somewhat dreary look of an empty back stage. The back of the proscenium must be arranged for the fire curtain, draw curtain, sprinkler pipes, picture screen and lighting effects. The switchboard should be sunk or raised so as not to interfere with the operation of the play, and all the local regulations will have to be carefully studied; and adequate special exits must be provided for the stage. Other special features of the auditorium are the motion picture booth and its ventilating system; the manner of lighting, which must not interfere with the projection machine; the type of entrance doors,—whether with or without transparent glass; and the type of ceiling. If the auditorium is contained in the center of the building, outside light is often admitted from the roof, which involves much care of the glass ceiling. This arrangement, however, seems to be passing out in favor of the exterior auditorium with side windows.

Aside from these observations regarding various special items of schoolhouse construction, there are certain basic requirements which ought to be kept in mind in drawing up the details. Among these are durability; ease of maintenance; economy in first cost, (which would include transportation and time required for obtaining the product); suitability for attractiveness of appearance. Mouldings with sharp edges or wide flat surfaces which collect dust are easily damaged and unsuitable, and yet one often sees clothes racks or stair newels carrying the full Doric order as decoration. Wall tiling has its place in toilets and corridors, but one of the most costly and highly praised of the recent high schools has the boiler room finished in white glazed tile and the main corridor in cheap textured plaster! Many chapters might be written about exterior detailing. Some optimistic members of the profession believe that painting the back of a parapet wall with some evil-smelling compound is a perfectly good substitute for 16-ounce copper, and they wonder why their million dollar roof leaks after a couple of years. Others are completely in the dark about the mysterious efflorescence which appears under their window sills, or the strange disintegration of elaborate pinacles and ornaments. To all concerned in schoolhouse building, the question of detailing is a fascinating and profitable subject, which will repay study.

SCHOOLHOUSE MAINTENANCE AND MATERIALS

BY

GEORGE F. WOMRATH

ASSISTANT SUPERINTENDENT IN CHARGE OF BUSINESS AFFAIRS, MINNEAPOLIS PUBLIC SCHOOLS

TWO billion, three hundred forty-four million, nine hundred eighty-four thousand dollars! This represents the contract expenditure for school building construction and equipment in 36 states for the past seven years only. As the greater part of this construction work has been financed either by long term or short term serial bonds, it is fair to estimate that the actual cost to the tax-paying public for these schoolhouses by the time the bonds are retired will be 50 per cent more than the principal sum, or a grand total of \$3,517,476,000. For the entire United States the gross investment in school building construction for the seven years, for which the foregoing figures were compiled, was a sum considerably more than \$3,500,000,000, practically all of which must be paid by taxation.

With the completion of a school building, its cost to the public does not cease; there at once begins the cost of operation and maintenance. This latter cost becomes an index of the wisdom shown by those responsible for the original construction investment. The figures involved are so large that even a small percentage of saving becomes an impressive amount. It behooves those accountable for the handling of public school funds to carefully consider every item entering into the construction and equipment of a school building and to weigh its original cost against its subsequent cost of maintenance. It has been repeatedly demonstrated that, by carefully revising the plans and specifications of school buildings upon which bids have exceeded appropriations, a saving of from 5 to 10 per cent can be made. School board members, superintendents and school architects are called upon as never before to study the problems of schoolhouse construction, in order that the tax dollar may provide the best buildings possible, and that these buildings may be so constructed and equipped that subsequent maintenance costs will be a minimum.

Not many years ago, when a school building was wanted, the common practice was for the school board, or the superintendent, or the school building committee to select an architect and tell him to prepare plans for a school building of a stated number of rooms or to accommodate a certain number of pupils. In many instances the architect selected was totally unfamiliar with schoolhouse design. During this period, questions of economy and efficiency in schoolhouse design, construction and equipment received but slight study; as for standards for heating, ventilation, lighting and sanitation,—there were none.

Of recent years specialists in schoolhouse architecture, with their engineers, have made exhaustive and extremely valuable studies of the school housing problems in many cities, involving many types of school administration and widely divergent curricula. Surveys were made to establish relationships be-

tween educational activities and requisite floor space needed. The ultimate outcome of these surveys was use of the "candle of efficiency" in the report of the Committee of Standardization of Schoolhouse Planning and Construction of the National Education Association. Mechanical and physical data were worked out and made the bases for state and city laws, ordinances and regulations governing schoolhouse construction and mechanical equipment. These men carried their ideas from one part of the United States to another. During this period, architects and engineers practically determined all school building policy insofar as design, planning, construction and equipment were concerned, the superintendents confining their activities to instructional policy only. The pendulum had swung to the extreme of the arc. Schoolhouses were built almost without any consideration being given the superintendent; in many instances without regard to cost, elaborateness, or sizes and number of rooms. Time and time again a schoolhouse was handed over to the superintendent with the admonition to "go ahead and run it,"—a building in which he had had no part whatever in planning, designing or equipping.

Whether it was the high cost of the school buildings which were designed and constructed during this period of development or a recognition on the part of the superintendents of their waning control,—whatever the cause, by the year 1915 the pendulum began to swing back. Both educators and laymen began to recognize that the superintendent of a school system holds a dual position, which in industry is more often designated by the title of "general manager." He is not only responsible for the instructional phases of education, but also for the physical surroundings in which the youth of the nation are being educated. He is charged with the task of preparing the building and financial programs, and of appearing before the boards through which the money to carry out the programs must be secured, and of getting from them the needed appropriations. It gradually became fixed in consciousness that the principle of direct responsibility should be applied to school business as it is to industry, namely, that the person responsible for the quality of the product and its cost should also be made responsible for the complete organization and machinery by which the quality and cost of the product are determined.

As the superintendent began to be recognized in his dual role, we find the architect and superintendent discussing and selecting designs and elevations as to architectural beauty, grace and dignity; working out the problems of space allocation and economical floor planning for the kind, size and relationship of rooms needed and their utilitarian arrange-

ment; examining construction features and studying and comparing original costs and subsequent maintenance charges; judging building materials with respect to their practicality and lasting qualities, and selecting efficient mechanical and educational equipment on the basis of low original cost commensurate with economical operating expense and cost of maintenance.

"Cost" has become an important word in the modern school world. It represents a factor entering into every phase of modern school administration. Simply stating the cost of building construction, no matter upon what basis,—whether cubic foot, square foot, classroom, pupil, or any other,—does not reveal where a lack of economy may exist in design and equipment, either as to original cost or subsequent maintenance. A detailed analysis of all costs,—a picking to pieces of all of the factors of cost that enter into the design, plans, construction, equipment, construction superintendence, and architectural and engineering fees,—often reveals places where economies may be made to very favorably affect construction and maintenance costs without lowering in any way the ultimate educational, architectural and mechanical value of the building. What, then, are some of the items through which savings may be effected?

Types of Construction. The only three types of construction which have been countenanced in recent years for schoolhouses are defined in the Classification Code of the American Institute of Architects as:

"Type A. A building constructed entirely of fire-resistive materials, including its roof, windows, doors, floors and finish.

"Type B. A building of fire-resistive construction in its walls, floors, stairways and ceilings, but with wood finish, wood or composition floor surfaces, and wood roof construction over fire-resistive ceilings.

"Type C. A building with masonry walls, fire-resistive corridors and stairways, but with ordinary construction otherwise, i.e., combustible floors, partitions, roofs and finish."

Type A construction seems impractical for a school building. To provide fire-resistive materials for classroom floors and built-in furniture and equipment would involve not only a high cost, but would be prejudicial to the comfort and well-being of the pupils. A schoolhouse must be made safe for the youth housed therein. For this reason, Type C construction, often referred to as "slow-burning mill construction," is not as desirable as Type B construction. Furthermore, as it has been repeatedly proved that the difference between the cost of a Type B and a Type C building is often as low as 5 per cent and seldom above 10 per cent, it is extremely unwise to attempt a saving in this direction if for no other reason than to safeguard child life. The factors of insurance rates and maintenance charges are financial considerations which militate against any type of construction below that of

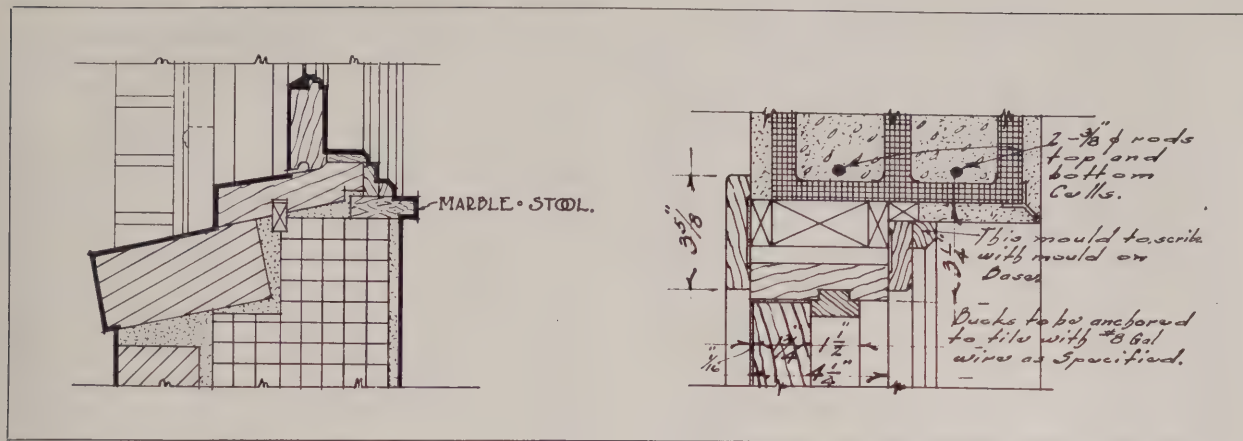
Type B. Not infrequently the temptation presents itself to build all one-story parts of school buildings of non-fire-resistive material. This is highly inadvisable, as the burning of these parts of otherwise fire-resistive buildings has not only caused large financial losses and the closing of buildings while repairs were being made but has caused stampedes which have resulted in large losses of life.

Materials and Details

Face Brick. In addition to making a comparison of the appearance and prices of brick which are to be used on the outside of the building, special consideration should be given to their size, durability and weather-resistive qualities. The selection of a small brick will involve use of many thousands of additional wall brick and a much greater labor cost in laying them; the increased number of joints will multiply the chances for maintenance trouble; while the gross cost of the brick and labor is often much more than that of a larger size of brick at a higher cost per thousand. Soft, underburned brick with poor wearing qualities, laminated brick, and glazed brick with surfaces that may easily be chipped, should not be used, if subsequent maintenance expense is to be avoided. In addition to natural wear and tear, the defacement of these bricks by school children is to be considered.

Parapets. There are certain kinds of parapets which should be omitted from a schoolhouse regardless of their artistic beauty, simply because they are costly to maintain, especially in cold climates where frost and freezing occur. Parapets which are irregular in shape, highly ornamented, or with port holes are especially subject to rapid deterioration. The cost, utility and durability of the materials used as the covering for parapets should be carefully compared. The principal consideration is securing a covering which will not disintegrate under the action of either time or the elements. The method of application of the material is also of vital importance. A material of strength and durability, if applied with exposed joints and meeting strips so that the weather can penetrate them, is soon forced out of position and rain water is admitted. When this happens the coping is loosened and is likely to fall; the wall beneath the coping disintegrates; and water leaks into the building, causing ruin of plaster, woodwork and paint. It is a costly operation to repair roof parapets and chimney tops, so a careful consideration of the material used to protect them and its application is important. Copings of tin and galvanized iron are not durable. Bronze and copper copings are not sufficiently serviceable to warrant their high cost. Plain stone copings or copings of glazed salt tile of a selected quality will endure, if the joints are made properly, as long as the building itself, and they are moderate in cost.

Roofs. A flat roof is less expensive in original cost than almost any other type of roof construction,



Typical Window Detail

Typical Door Jamb and Trim

Bureau of Buildings of Board of Education, Architects, Minneapolis

is cheaper to maintain, is more easily accessible, and is safe for the public. Sloping roofs covered with slate are deserving of special consideration. Unless the slate is applied with extreme care, and the roof provided with guards, the slate often becomes detached in windy weather and slides off, as does also the accumulation of snow, endangering the lives of persons who may be below. Tile roofs are difficult to lay so that they will be perfectly weather-tight and are difficult to insulate. Maintenance costs are not as much of a problem in their case as is the heating cost of the building.

Chimneys. In these days when chimneys on school buildings are no longer looked upon by architects as disfigurements, these shafts have become the objects of special architectural study. When confined to simple and dignified lines they can be made beautiful and attractive. Costly patterns built into chimneys are often obliterated by soot and dirt, especially if these designs are near the tops of the chimneys. A poorly constructed chimney is a perpetual cause of maintenance expenditures; a badly designed chimney results in high heating costs and often develops into a smoke nuisance. The inside of the chimney should be perfectly straight, or preferably somewhat smaller at the top than at the bottom. This is for the reason that as the gases ascend they cool and contract and require less area for discharge at the top of the chimney than they require at the bottom when leaving the breeching. If the stack is larger at the top than at the bottom, the draft is destroyed by the air rushing down the stack and establishing cross currents. This will also result in the chimney smoking badly.

Windows. Schoolhouse windows have been for years and still are the matter of much debate. Wood versus steel sash; double-hung versus swivel sash; casements versus French windows;—around use of these various types there goes on a seemingly never-ending dispute. It is claimed that use of steel sash increases the operating expense of a building because steel conducts heat out of the structure so rapidly that the burning of a considerable larger amount

of coal is required to properly heat the building. The original cost of installing window shades on steel window sash and their subsequent maintenance cost have also provoked much discussion. The experience of the writer has been that wood sash are preferable in northern climates.

Window Sills and Stools. It is false economy both in original investment and subsequent maintenance cost to build window sills and stools of any other than the very best materials. The drying, rotting, paint-removing, and wetting effects of the sun, rain water, and drippings from flower pots which are so often used in school buildings, have repeatedly demonstrated that sills and stools should be built of a durable material such as stone, brick or marble.

Entrance Doors. Heavy, metal-covered entrance doors were formerly looked upon as safety devices, in some mysterious way linked up with safety in case of fire. They were also looked upon as a means for protection from thieves, but are no longer considered in this light. Thieves enter through windows and by other easier means of ingress. Double-hung, light weight, glass paneled doors are being looked upon with more and more favor in school-house construction from the standpoints of appearance, ease of operation, economy in first cost, low cost of maintenance, and light for the space just inside the entrance. Instead of using double doors in a full width of opening without a mullion, the practice is becoming quite general of having two single doors with a small mullion between them. This type of construction reduces weight, minimizes shrinking and swelling, simplifies the application of panic bolts, makes possible the installation of weatherproof doors, and makes possible the use of compact, light weight, standardized door units at low maintenance costs at all entrance openings.

Door Hooks. Only too often means of holding entrance doors open are omitted, resulting in some would-be mechanic's applying hooks or cleats which mar and cut the woodwork and not infrequently gouge deep grooves in valuable stonework. All such appliances should be avoided, and preference be

given to one of the many kinds of automatic door catches which protect both door and woodwork and involve practically no maintenance charge whatever.

Outside Door Sills. Door sills which are made of a soft material, such as wood or slate, soon become cupped and present a very dangerous hazard for the school children who must cross them several times daily. Ordinary iron sills are slippery and, therefore, hazardous. Sills which become cupped need to be frequently replaced, since they admit large amounts of cold air in winter weather under the doors. Granite sills are durable, safe, and afford an unquestioned economy in maintenance. There are various durable non-slip sills which are satisfactory.

Window Glass. Plate glass for general use in a school building is an extravagance when compared with the use of the high grade, single-strength, selected glass of modern manufacture. The lower cost of the latter is noteworthy, as glass breakage is a considerable item of maintenance expense in all school buildings. It has been said that New York spends \$90,000 every year for glass replacement, and Chicago \$75,000.

Flooring. No other feature of schoolhouse construction has been given more consideration than the material which should be used for schoolhouse floors. Wood, cement, tile, asphalt, rubber, stone, linoleum, mastic, terrazzo, cork, and many other materials have been used more or less successfully. In this problem of selection, the matter of appearance is often the deciding factor, whereas durability, ease of cleaning, and maintenance cost should be the main considerations. If pupils' desks are changed frequently, will the floors be damaged by reason of the many screw holes? Will the floors be soft and sticky? Will the floors be cold, hard and noisy? Will the floors hurt the feet of the children? Will the hardness of the floors cause breakage of tools which may be dropped on them? Will the softness of the floors cause them to be damaged if pianos and heavy furniture are moved across them, or will heavy equipment sink into the floors, leaving them full of bumps and holes? These are some of the questions to be answered when selecting a schoolhouse floor. Not infrequently the faulty installation of an otherwise excellent floor material builds up subsequent maintenance costs as much as does the selection of an inappropriate kind of flooring.

Inside Trim, Toilet and Shower Stalls. In a school building filled with irresponsible youth, the use of materials which will withstand the onslaughts of jackknife and pencil artists is a phase of the construction problem which is frequently overlooked. A child likes to lean against the walls, or to stand with one leg crooked with foot against the dado. For these reasons, corridor dados should be of hard surfaced brick, or tiling, or some other hard material which can easily be washed. Shower and toilet stall partitions should be of rugged construction and of a material that cannot be readily cut, scratched or marked. In toilet and shower rooms, and

wherever there is any moisture, the use of wood should be avoided as it is unsanitary and costly to maintain. Enameled cement or steel partitions are good looking, sanitary, durable, less likely to be marked and cut by pupils, easily repaired, and their use is attended with low maintenance cost.

Wood and other materials of an absorbent nature should not be used in any room where there is a great amount of moisture or where immaculate cleanliness is demanded and frequent scouring necessary to prevent insanitation. The original low cost of wood construction in all such locations is offset many times by subsequent cost of upkeep.

Specially Fabricated Steel. The widening of a classroom by a few inches sometimes requires that the beams be enlarged or that especially designed beams of specially fabricated steel reinforcing be used. This at once adds considerably to the cost of construction. The superintendent should not interfere with purely architectural structural matters, such as foundations, walls, floor slabs, girders, beams, spans and other physical details. There have been many instances, however, where a general inquiry by the superintendent or architect has revealed that, without interfering with the educational efficiency of the building in any way, the reduction by a few inches of the width of classrooms has made possible a complete change in the structural framing detail of the building at a great saving in cost of construction and maintenance. The use of standard stock materials and forms results in large economies. The only places where the use of expensive, specially fabricated steel is excusable are under balconies in auditoriums, in order to avoid use of columns which would reduce the seating capacity and impair the visibility of the stage, in special study rooms, and in gymnasiums when classrooms are to be built over them.

Heights of Ceilings. The standard height of a school classroom is 12 feet, measured from floor to finished ceiling. The finishing of the ceiling generally comprises metal lath on the under side of the ceiling beams and the finished plaster applied to this lath. The thickness of this construction, from the under side of the finished plaster ceiling to the top of the ceiling beam is, on the average, about 1 foot. In schoolhouses recently constructed, a little more attention has been given to the formwork in order to produce a more even finish to the concrete after the forms are removed. The concrete is then treated with a light application of cement wash which gives the entire surface a smooth finish. The metal lath and plaster are omitted. The concrete beams are left exposed and present a very pleasing appearance. This construction is very much less expensive and reduces maintenance cost to practically nothing. It possesses the additional advantage of reducing the floor-to-floor height by 1 foot. In the average 18-room elementary school building this represents a saving of about 17,920 cubic feet per floor. Exposed beams improve acoustical properties.

Wall Finish. The wall finish in schoolhouses is,



Heavy Solid Doors



Lighter Glazed Doors

Lighter Doors Are Growing in Favor for Several Reasons

generally, either smooth or rough plaster. Many years of experience with both kinds of finish and of observation in hundreds of schoolhouses, leads to the opinion that smooth plaster is much more easily marked and damaged than is rough-finish plaster, the original cost is higher, and the making of repairs is more difficult and costly. In industrial rooms the environment should approximate, as nearly as possible, the conditions which prevail in industry. It is not objectionable, therefore, to leave the tile walls unplastered, but painted. There is no need of plaster on the walls of these rooms, and its absence adds to their industrial "atmosphere" and reduces the cost of construction and maintenance.

Corridor Walls. Corridor walls are usually built flush on both the classroom and corridor sides of all supporting columns, and frequently with an additional breathing wall on the corridor side. This is done in most instances for two reasons—to avoid the exposure of supporting columns and to hide the ventilation ducts carried up through the building. Wherever experiments have been made in the elimination of all unnecessary filler tile, there has been a great gain in corridor space, part of which has then been used for built-in lockers and cupboards. Exposed columns in public school corridors are no longer considered objectionable. Where unit classroom ventilation is used, all vertical duct work and breathing walls are eliminated. This saves from 12 inches to 18 inches of corridor space, resulting in a very noticeable reduction in construction cost.

Lintels and Door Anchors. One of the most

aggravating and persistent sources of schoolhouse maintenance cost is due to badly constructed door lintels and poorly anchored door frames. Every door lintel should be reinforced to prevent it from cracking or sagging. When a door frame is not securely anchored into the supporting walls, the constant jarring due to the opening and closing of the door soon breaks the plaster surrounding the frame. When this happens the only thing to do is to reset the entire frame, or there will be a continual maintenance charge.

Wardrobes. Schoolhouse wardrobes or coat closets present a problem which causes much discussion among architects. It is safe to say that there can be no quarrel with the statement that exposed wardrobes are objectionable. Of other types there are three which are being quite generally used,—the wardrobe which is a separate room at the end of the classroom; the wardrobe which is built into either the end or the corridor wall of the classroom and which may be shut off from the classroom by pivoted or sliding doors; and individual lockers. If an opinion may be ventured, it would be that lockers have not been found to be satisfactory or practical in elementary grade school buildings. Small children cannot reach the hooks in the upper tier of lockers, with the result that their wraps are jammed into the bottoms of the lockers along with overshoes and other articles. In wet weather this condition is highly objectionable and unsanitary. The locker doors are frequently left open, and no little damage is constantly inflicted upon the hinges, locks and

handles, which quickly runs up a considerable maintenance charge. Built-in wardrobes occupy wall space which may be used to better advantage by continuous blackboard surfaces. This type of wardrobe, when built into the corridor wall, also either reduces the width of the classroom or increases the width of the building, thus increasing construction cost,—and as in most instances where there are a large number of moving parts of some weight, the cost of maintenance is considerable.

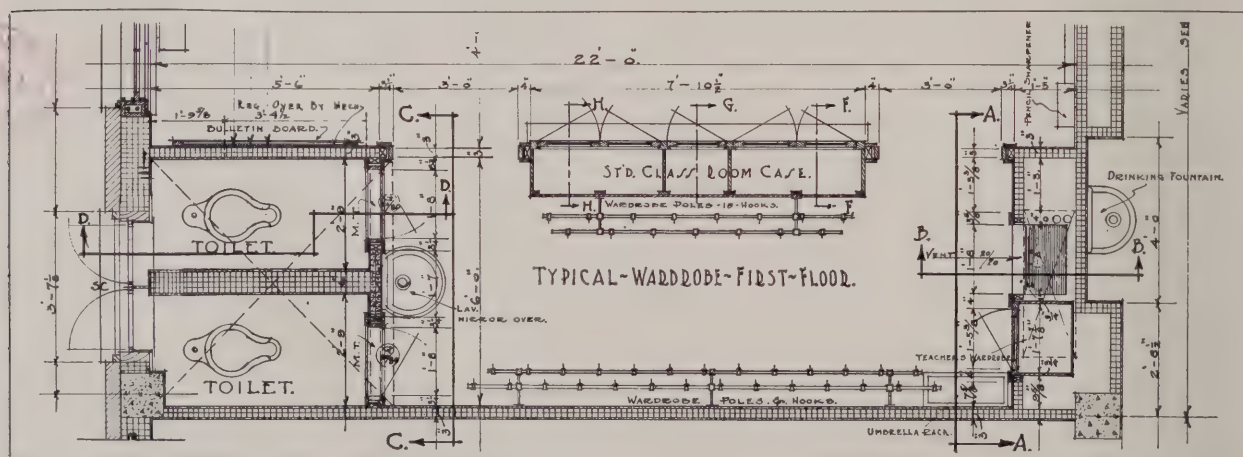
Modern education is requiring more and more storage space in every classroom for materials and supplies. To meet this trend, the separate room end wardrobe is meeting with much favor. This room may be separated from the classroom by a half-height cupboard and bookcase. The low height permits sufficient light to pass over the top of the cupboard to light the wardrobe well. The cupboard may have deep shelves at the bottom, for storage of the largest sizes of project work, and narrow shelves above for storage of books and supplies. This type of wardrobe permits a better circulation of the pupils in the classroom, renders it possible to avoid congestion when getting cloaks, multiplies the storage area many times, eliminates the use of all other closets in the classroom, and reduces maintenance and operating charges to a minimum.

In General. A large maintenance expense is always introduced in schoolhouses where classroom display work, pictures, maps and charts are fastened to the wood trim and walls with pins, tacks, nails and stickers. Picture moulding should be furnished throughout the building, and no pictures should be hung except from this moulding. Means should be provided above the blackboard frame and below the chalk rail in every classroom, and display work should be hung by small clamps.

Schoolhouses are being built to last for 50 years or more. It, therefore, behooves the schoolhouse architect to equip his building with appurtenances which will have an equally long life under severe usage. Under this heading fall hardware, which should be of standard stock designs, strong and

durable; kick-plates at the bottom of all doors to withstand the agile boot toes of children in a hurry; door checks to prevent doors from slamming, which is not only distracting but involves a severe strain on the doors and casings; natural slate blackboards, which will outlast the building itself, and when in need of resurfacing can be inexpensively rehabilitated with a piece of pumice stone or a common brick at a cost of less than five cents a square foot; balustrades, which may be built of reinforced concrete and made an integral part of the stairs themselves and never require any maintenance outlay, especially if the handrail brackets are anchored clear through the thickness of the balustrade and bolted; and a multitude of seemingly minor details, inconspicuous in themselves but which, when assembled in a composite list, constitute a formidable array of features indispensable in schoolhouse construction and equipment.

These are some of the items in connection with schoolhouse construction,—the selection of materials and maintenance cost,—which are receiving the analytical attention of all progressive school superintendents and architects. In addition, there are many items of mechanical equipment and educational equipment which are deserving of as careful study and selection as is given the items entering into the building construction, in order that much unnecessary expense in both original cost and subsequent operation and maintenance cost may be avoided. As it becomes more and more difficult to secure the enormous sums of money needed to meet the growing cost of public school activities, the first form of pressure that has been brought to bear is the demand that a saving be made on the material side,—the building construction side,—so as to release more of the available funds to the instructional side of education. This movement has brought the members of the school board, the superintendent and his assistants, the architect and the engineer into closer contact than ever before in the history of the public schools. Each has his important part to play in the great business of education.



Room End Wardrobe. Toilets Are Omitted in Some Cases, and Teacher's Unit Occupies a Portion of the Window End
Minneapolis Bureau of Buildings of Board of Education, Architects

HEATING AND VENTILATING THE SCHOOL

BY

ALFRED KELLOGG
CONSULTING ENGINEER

THE unusual interest aroused in 1923 by the publication of the "Report of the New York Commission on Ventilation," which interest still continues, is sufficient warrant for an article reviewing the present status of school heating and ventilation from the standpoint of the architect.

¹ *The Present Situation.* Since the beginning of the century and up to the year 1920, the several methods, or so-called "systems" of school ventilation were considered reasonably standardized. During the last 25 years the newer thought had evolved the broader idea of what is now termed "air conditioning," involving something more than the supply of warmed air; but for various reasons its application to school ventilation had made but little progress. In the latter half of the decade from 1880 to 1890, the results of research work by Pettenkoffer, confirmed by similar work carried on by French and English scientists, began to take practical form in an effort to supply a given volume of air to the pupil. The theory then advanced as the result of the research of that period seemed to indicate the need of supplying 30 cubic feet of fresh air per minute to each occupant of a schoolroom,—not that all of the 30 feet was deemed necessary for the actual need of the pupil, but rather for lack of known means of procuring proper diffusion throughout the occupied space and consequent dilution to a standard condition of purity.

Just here it is well to draw attention to the fact that no standards of air volume and purity have ever originated with the engineer or the architect. On the contrary, such requirements have always been laid down by the biologist, physiologist and their followers in the medical profession. There are today many among the same professions who would relegate the work of the past delvers into this particular branch of science to the limbo of those scientific truths that are not so. The subject, therefore, is at the moment highly controversial, but sooner or later the present fog of uncertainty will be lifted, and a rational scheme of school ventilation will probably be evolved which the writer suspects will measurably differ from the extreme positions now occupied by both parties to the present controversy.

If ever the medical profession, the physicists and the hygienists agree among themselves as to the proper atmospheric conditions to be maintained in our schools, the architects and engineers may be depended upon to fully meet the newer requirements. But before ignoring the sign posts of the past, reckoning them as entirely worthless, let the truth be ascertained by those best qualified for the task. This means broad-minded research by those branches of the medical profession qualified by some experience other than that of the laboratory, and

it is gratifying to know that at this time whole-hearted efforts looking to a better understanding of the primary relation of fresh air to the health of the pupil are under way. As a hint to the school teaching profession, the engineer and architect and those not specially trained in the biological aspects of the subject, it would be the part of wisdom to reserve judgment with that modesty inspired by ignorance, until those better qualified than themselves reach a solution of the problem. With this brief review of present status on the subject, it may be well to consider the surviving schemes of school ventilation, for upon some or all of them must we still rely until such time as we shall know of something better;—keeping in mind also that those states heretofore having laws or regulations governing the matter have so far failed to remove them from their statute books.

The School Unit. In a short article a full discussion of all the controlling factors is impossible; therefore only the school unit,—the classroom,—will be considered. If the class and recitation rooms are properly warmed and ventilated, the other school apartments can be readily disposed of, and these will be briefly considered later on.

Systems Available. There are today probably not more than a half-dozen so-called systems of school heating and ventilation worthy of consideration, and these will be briefly described, omitting consideration of the one-, two- or three-room rural schools wherein the ventilating stove or the warm air furnace is usually found which affords reasonably good results where properly installed and operated. These small schools constitute by far the greater number, taking the country as a whole, and deserve greater care in design than is usually accorded them.

In the larger school buildings steam or vapor systems of supplying heat are generally employed. Vapor heating, it may be said, is nothing more or less than heating by steam at very low pressures, say not to exceed 8 ounces. In its simpler forms, no moving machinery, pumps, and the like are required for their successful and satisfactory operation; therefore, starting with the assumption that steam is to be the heating medium and for classrooms to accommodate about 40 pupils, the systems in more common use today are:

1. The gravity indirect system of heating with gravity ventilation.
2. The plenum fan system, better known as the "straight" or control fan system.
3. The "split" system.
4. The unit ventilator system.
5. The so-called "open-window system."

The Gravity Indirect System. This system is

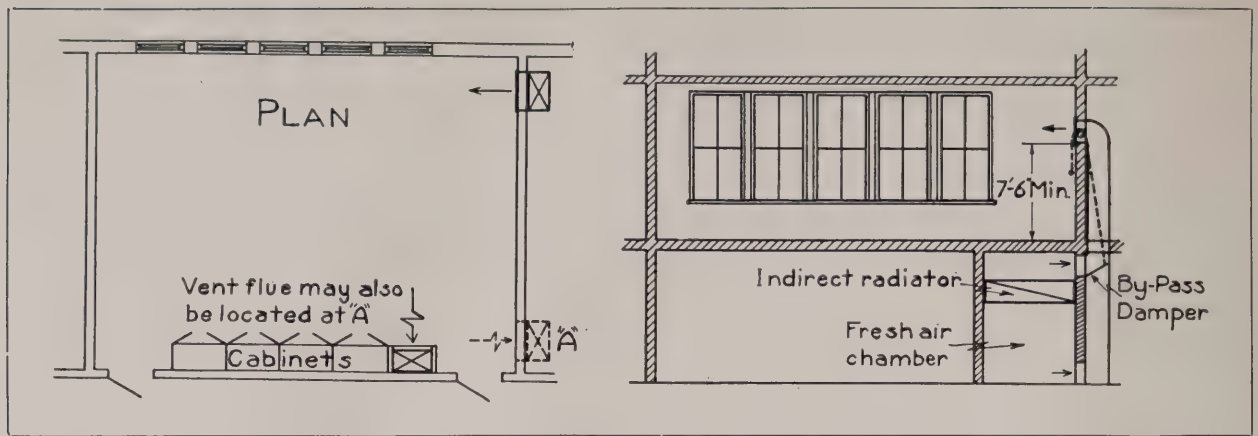


Fig. 1. The Gravity Indirect System of Heating and Ventilating

rarely used today in other than small buildings of from 4 to 12 rooms. It is one of the least valuable of the survivors of early experiments. It consists of a single flue for supplying warm air to the room and a single exhaust flue. In the basement there is installed an indirect radiator placed about 20 inches below the ceiling and just to one side of the warm air flue. Fresh air from outside is brought to the radiator where it is heated, passing thence to the room. A mixing damper is so placed at the base of the warm air flue that the temperature of the room may be kept at the proper point. The warm air, in volume (according to accepted standards) equal to 30 cubic feet per minute per pupil, should enter the room not less than 7 feet above the floor, and this flue should be placed in the same wall or in a wall adjacent to the exhaust flue. The opening into the vent flue should be at the floor. Neither flue should be on an outside wall, nor should the flues be on opposite walls.

Occasionally in this system, direct radiation is also installed in the room, but while the heating results may thereby be simplified, it is inevitably at the expense of the ventilation, due to the lower temperature required in the fresh air supplied, keeping in mind that the volume of air supplied by this system is dependent upon its temperature. The velocity of the air in the flues may be taken as 300 feet per minute in a two-story building. This velocity will be exceeded in very cold weather, thereby supplying more than the required volume of air, but in average winter weather the velocity is likely to be much less, with correspondingly less ventilation, than any other.

The advantages of this system are: 1. It is usually low in first cost, probably lower than any other. 2. It is simple to operate and usually not extravagant in fuel consumption. 3. Maintenance costs are reasonably low.

The disadvantages are: 1. That it usually precludes the use of the basement for any purpose other than boiler and coal space and playrooms. 2. It is unreliable in results, as the supply of fresh air to the rooms and consequent ventilation are dependent wholly on

the outside temperature. The result is that official inspectors are not required to test for air supply and ventilation when there is less than 40° difference between the outdoor temperature and that of the air entering the room. That, in practice, usually means a deficiency in ventilation when the outdoor temperature is 35° to 40° or higher; ventilation by such a system is inadequate for at least half the heating season. 3. Its difficulty in keeping the indirect radiators and flues clean.

The Plenum Fan System. Considered simply from the standpoint of positive ventilation attained, good diffusion throughout the occupied space, and heating results generally, this system in the average sized school leaves little to be desired. Unfortunately, however, the fan cannot well be kept running during the night, resulting in there being a cold building in the morning, and requiring considerable time to get the walls up to room temperature and comfort. This condition also results usually in high fuel cost, and for that reason this system is infrequently employed. It has the advantage, however, of supplying at all times when heat is required, an adequate degree of ventilation, for in order to keep warm, the school authorities necessarily have to supply air for ventilation.

In designing a building for this system, the same arrangement of flues would be followed as outlined for use with the gravity indirect system previously described, except that the warm air flues may be proportioned for a higher air velocity, say 400 to 450 feet per minute; but the openings into the room should be kept down to 300 to 350 feet per minute in order to avoid objectionable drafts. In some states 300-foot velocity is the legal maximum for a standard-sized classroom. In this system the location and size of the vent flue remain as previously described for the gravity indirect system. The supply ducts from the fan, usually in the basement, may be of a size permitting much higher air velocities, reaching 800 to 1000 feet in main ducts, and in branch ducts to base of upcast warm air flues of from 500 feet to 700 feet.

For heating the air before delivery to the rooms,

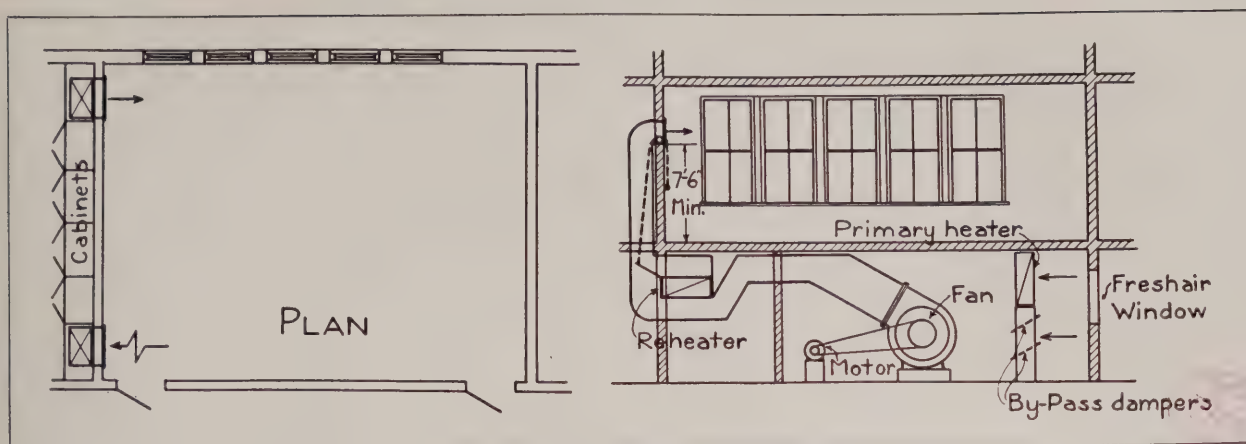


Fig. 2. The Plenum Fan System of Heating and Ventilating

an indirect radiator, or "Stack," so-called, is usually placed at the base of each warm air flue with a by-pass or mixing damper permitting temperature control either manually or from a room thermostat. In this arrangement the air at outdoor temperature is blown by the fan through ducts to the radiators where it is raised to whatever temperature may be required by the different rooms. In a modified and somewhat better designed installation the outdoor air may first be warmed by radiators or primary heater to 50° or 60° as it enters the fan chamber, and thence is delivered to the re-heaters at the base of the warm air flues as just described. In extremely cold weather, in order to maintain 68° to 70° room temperature, the temperature of the air as it enters the rooms might be as high as 115° (or even more) on the exposed side of the building, while at the same time it might not exceed 95° to 100° on the sheltered or sunny side. In the afternoon, with the sun farther around in its daily cycle, this condition may be found reversed, showing the need of adequate means for controlling the room temperature under all weather and exposure conditions.

All in all, the straight central fan system has much to offer in its favor, and were it as economical in fuel consumption as some other systems, it would no doubt be more generally installed. The advantages of this system are: 1. That it is reasonable in first cost. 2. It is adequate in heating and ventilating results. 3. Its maintenance or cost of upkeep is low.

The disadvantages are: 1. That it means continuous power expense, but no greater than in any other mechanically-operated system. 2. In cold weather some difficulty is frequently met in average building construction in getting the walls of the rooms up to a temperature that will not cause a feeling of chilliness to those sitting near them, although the air temperature may indicate 68° to 70° on an inside wall. 3. It is generally uneconomical in fuel requirements.

The "Split" System. This mechanical system is perhaps that most commonly employed in schools of considerable size, for with all its defects it does provide facilities, *where properly operated*, for adequate heating and ventilation according to present stand-

ards. It combines the use of direct radiation placed along the outside walls beneath the windows with a positive fan supply of fresh air warmed to from 70° to 80° , with the exhaust flue of usual size and location. It provides the air diffusion so greatly desired.

Alas, however, its very flexibility often defeats the virtue of its employment, for the frugally minded public authorities and that well known official, the janitor, severally or jointly contrive in average winter weather to heat the school rooms from the direct radiation only, without the use of the fan, thus saving fuel, but providing no adequate degree of ventilation. In this system the permissible air velocities through ducts and flues would be the same as in the plenum fan system. The location and use of the indirect surfaces (radiators) likewise are the same, but the degree of heat to be obtained thereby may differ from the preceding illustrations. In some cases the primary heater may be designed to heat all of the incoming air to from 60° to 80° which with the direct radiation in the rooms, usually proves sufficient regardless of north or south exposure. This is especially true where the direct radiators are under thermostatic control, it being understood that the primary heaters are similarly controlled. In larger buildings or in those where varying temperatures are needed in certain rooms, the tempered air at the fan may be only 45° to 60° , and in such cases a re-heater is placed at the base of the warm air flues serving to raise the temperature of the air delivered to the rooms to the desired point. This latter arrangement requires, in order to afford satisfactory results, the use of thermostatic control of the radiators both primary and direct. Occasionally, also, there may be found in this system the installation of one or more fans connected with the exhaust flues. Their use would not alter the location of the exhaust flues, but would permit higher velocities therein, say up to 450 to 500 feet per minute where the exhaust fans are to be depended upon at all times. The inlet velocity from the room to the exhaust flue should not, however, exceed 300 feet per minute to avoid uncomfortable drafts at the floor.

Where direct radiators are placed under the win-

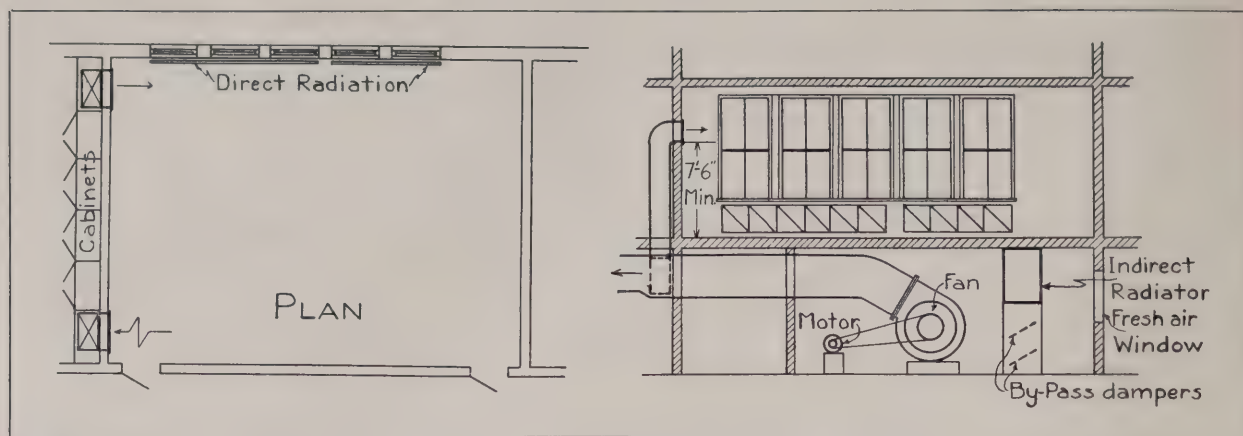


Fig. 3. The "Split" System

dows alongside the outer row of desks, complaint is often heard of the excessive heat to which the pupils are subjected. A sheet metal shield may be attached to a radiator extending from a point about 6 or 8 inches above the floor to the top of the radiator, and thus afford the desired protection. With this system the arrangement of the flues and their relation to the classroom would be as shown in Fig. 2.

The advantages of this system are: 1. Its being very low in fuel consumption. 2. That it is simple to operate, flexible. 3. Its being low in upkeep or maintenance costs.

The disadvantages are: 1. That installation costs are greater than for a gravity indirect or plenum fan system. 2. That from its very flexibility it is too easily subject to human manipulation in the sole interest of fuel economy.

The Unit Ventilator System. This is one of the most flexible systems known, combining in the individual classroom everything needed for its satisfactory heating and ventilation other than the boiler and pipe connections. The installation consists essentially of an indirect radiator; a small fan for the positive supply of fresh air taken from without the building through a wall opening; a fractional horse-power motor for the fan propulsion; all contained within a substantial metal enclosure. Usually a direct radiator also is placed against an outside wall to supply the heat necessary to compensate for that lost through wall and glass surfaces. A suitably placed damper excludes the air from outside when school is not in session, and a by-pass damper in the unit heater is employed to regulate the room temperature either manually or by thermostat.

All unit ventilators, so-called, are provided with means for recirculating the air from the room through the device and for the exclusion of fresh air from outside. This type also strongly appeals to those civic authorities having an eye solely to the conservation of fuel, for in practice the unit ventilator will frequently be found shut down, and for heating the room, dependence will be placed on the direct radiator; or perhaps the device may be used to recirculate the warm air in the room with no fresh

air supply. It is often best to specify that the recirculating feature be omitted, and where possible, that the direct radiator be also omitted from the room, thus assuring positive ventilation, at least whenever heat is required. Some unit ventilators operate upon the high velocity jet principle, the air leaving the unit directed toward the ceiling and at velocity varying from 800 to 900 feet per minute. These high velocities secure ample diffusion and equality in temperatures throughout the room.

Efficient installation requires that the unit be placed near the source of fresh air, as on an outside wall, with the exhaust on an inside wall located as far from the unit as possible. The exhaust flue may be proportioned for a higher velocity than is permissible in other gravity exhaust systems, say as high as 600 to 700 feet per minute, the flue being carried through the roof in the usual manner.

The advantages of this system are:

1. That each room may be treated as a unit, in no way dependent upon any other room for its successful operation. This is of greater importance in high schools than in the lower grade schools.
2. It affords a positive supply of fresh air to the rooms, properly warmed and generally well diffused.
3. It eliminates the warm air flue and connecting basement ducts of either masonry or sheet metal.
4. That the units are reasonably quiet in operation.
5. Maintenance or upkeep costs reasonably low.
6. That fuel cost is about the same as in any systems supplying an equivalent volume of outdoor air.

Its disadvantages are: 1. That it involves a higher initial cost than the other systems here described. 2. That it requires a multiplicity of small fans and motors to be looked after and kept in repair. 3. That it takes up some space on the outside wall of the classroom, varying from 14 inches to 20 inches from the wall and from 3 feet to 4 feet in length.

The "Open Window" System. This means a new adaptation of an ancient unsuccessful attempt to ventilate school rooms, which a former generation endured and then happily discarded. This observation must by no means be construed as an indirect expression of opinion concerning the merits of the

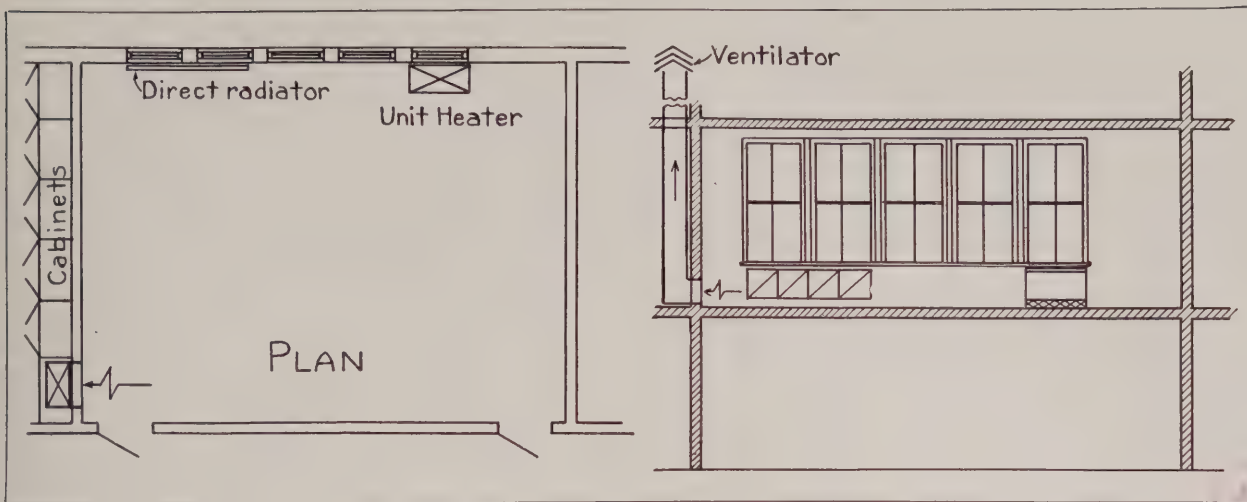


Fig. 4. The Unit Ventilator System

controversy now in full swing as to what constitutes the proper air conditioning of schools. It is just a plain statement of fact, as any observer of the conditions existing in urban schools of the early 90's can testify. Neither is the system referred to herein for any reason other than to acquaint the architect with its salient features.

In its entirety this system consists of just two exhaust flues, each of 4 square feet area, and of one or more radiators having a total surface of from 250 to 300 square feet. Each exhaust flue has an opening at the floor and also one at the ceiling. No means for creating a movement of air in these flues is advocated by the proponents of the system. Hand control only of the radiators is permissible. Deflectors at the window sills give direction to the increasing air when the lower sash is raised. In *theory* the incoming air (with the wind from the right direction) is warmed from the radiators, is deflected to the upper part of the room, and passes out through the upper openings into the exhaust flues; but if by chance the air falls, then opportunity is afforded for its passage into the exhaust flues at the floor. In this natural process of diffusion, drafts are ever present. Perchance luck may favor the anæmic (by no means rarely) in having for a teacher one whose comfort zone hovers around the 80° median, in which case the windows stay down. In *practice*, with the wind blowing from some other direction, expired and fresh air from other rooms and sources reaches the classroom under consideration via the corridors, or perhaps down the exhaust flues, thence, after being duly warmed by the radiators, passes out of the windows. This, of course, assumes that the windows are open, but usually for some reason or other they are kept closed. That the windows will be found in large part closed when the outside temperature is below 50°, is not an idle statement concerning the usual manner of operating the ventilation of such schools, *after* the investigating commission or other authority has completed its occasional or periodical

survey. It should also be unnecessary to say that during such a survey the system is, of course, operated the way it was intended to be, but the same may as truly be said of any other system under similar circumstances. This system is not suitable for assembly halls, gymnasiums or classrooms accommodating more than 40 to 50 pupils.

Briefly, the human element in the operation of schools equipped with this system reacts in precisely the same fashion as in schools otherwise equipped, but with this difference: that when an "open window" system is installed there is an absence of control over the volume, temperature, humidity or any other desirable (yet to be determined) quality of the air the pupils breathe. If the room gets too cold, the remedy is to close or partially close the windows, and incidentally cut off or reduce the supply of fresh air.

The advantages of this system are:

1. That installation cost when properly installed, is about 10 to 15 per cent less than for a "split" system.
2. Its upkeep or maintenance cost is low.

Its disadvantages are:

1. That no control of proper air conditions is assured.
2. That to maintain the best room conditions with this system requires the constant and intelligent watchfulness of the teacher, and takes her from her legitimate duties.
3. Its fuel consumption is fully as great as in a well designed "split" or unit ventilator system, either of which will provide under all weather conditions from two to three times as much ventilation.

The Auditorium. Such rooms cannot well be standardized as to their heating and ventilation, varying as they do in design and outside window spaces. Those with small exposed walls and few windows usually require the supply by positive means, of fresh air, with of course means of heating. The air supply to auditoriums where not governed by official regulations, may be much less than in classrooms, owing to the usually shorter periods during which they are occupied. Based upon the full seat-

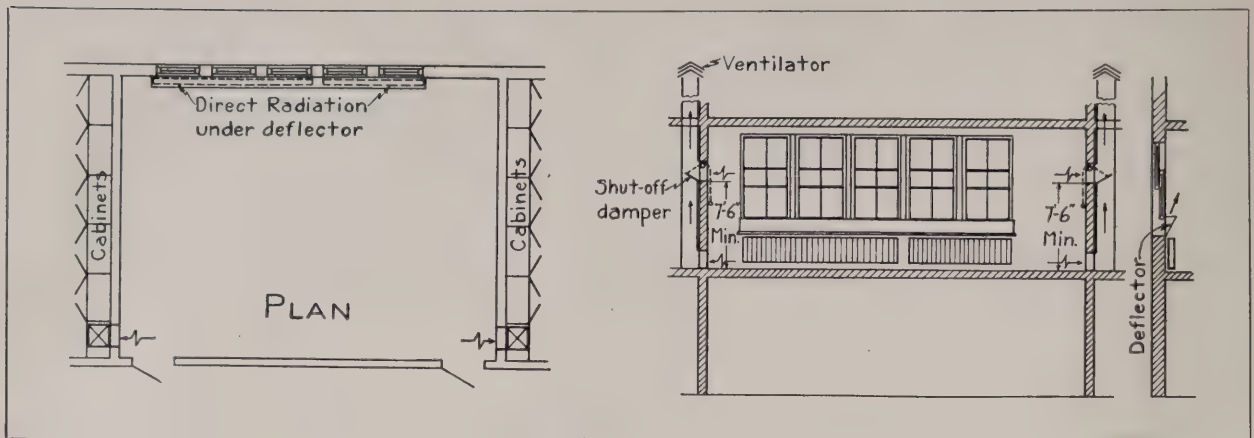


Fig. 5. The "Open Window" System

ing capacity,—allowing 6 square feet floor and gallery area per occupant,—the supply of from 10 to 15 cubic feet of fresh, warmed air per minute is considered sufficient. The temperature of the incoming air should be under thermostatic control, and it is desirable also, that the direct radiators should be similarly controlled. On the score of fuel saving, direct radiation should be installed in sufficient amount to keep the walls and furniture warmed.

Where there is an abundance of window space, and especially an opportunity for cross ventilation, roof ventilators for the relief of an overheated room, due to a combination of a large audience and mild weather will seldom be required. The warm air flues should be of an area for an air velocity of from 350 to 500 feet per minute, with a velocity through the openings into the auditorium varying from 350 to 500 feet per minute, depending upon the height from the floor to the bottom of the warm air grille. The flues may be located at one or more points in the room, and in some cases the exhaust may be taken through the front of, and under, the stage, if any, there connecting to upcast flues to ventilators or fans on the roof. Where an exhaust fan is installed, the exhaust flue velocity may be from 500 to 700 feet per minute.

Gymnasium. Such a room, in the absence of official regulations, would be heated and ventilated much the same as an auditorium, but owing to the character of the exercises, greater reliance can be placed upon window ventilation, and such a room should not be heated above 60° unless it is to be used as a combination gymnasium and auditorium.

Swimming Pool and Shower Rooms. There should be sufficient direct radiation properly installed and controlled, to maintain 80° temperature with ade-

quate ventilation, either through exhaust fans or ample gravity exhaust flues. Fan supply of fresh air is rarely desirable in such rooms. Dependence for ventilation should be placed wholly upon the exhaust, with inlets for gravity supply of warm air.

Dressing and Locker Rooms. These should be warmed by direct radiation to about 70°, and there should be ample exhaust, preferably by fans.

Toilet Rooms. Such rooms with one or two fixtures, if located with ample outside windows, are seldom provided with special means of ventilation. General toilet rooms should be ventilated by means of fans to the extent of eight to ten air changes per hour, and heated by direct radiation only to about 65°.

Plant Operation. No matter how well a heating and ventilating plant is designed and installed, unless there is to be coöperative effort on the part of the school and town or city authorities, the best results from the installation will rarely be obtained. Whatever may be the final decision concerning the proper atmospheric conditions to be maintained in schools, so long as the authorities place fuel saving above the health of the pupil, or the janitor is inefficient and incompetent, anything but satisfaction is to be expected from any installation. In the final analysis, however, it is the public that must be brought to realize the facts,—by educational methods,—and to insist upon an adequate return for the expenditure of public funds.

Auxiliary Equipment. No mention has been made of air washing, humidifying or ozonating apparatus, and but brief reference to automatic temperature control. These auxiliaries are essential in many instances, but they require more space for their adequate description than can be accorded in this article.

THE ARTIFICIAL LIGHTING OF SCHOOLS

BY

D. J. FRANDSEN

ELECTRICAL ENGINEER

THERE are certain quite fundamental and obvious reasons why artificial lighting should be provided in all schools. Perhaps the most important of these is the fact that provision must be made for those inevitable cloudy or stormy days, which, in some localities, comprise such a startlingly large percentage of the school year. The increasing prevalence of night schools and the fact that the school building is often used for various community meetings, in addition to school activities, are direct evidences of the need of artificial light.

Of all the facilities placed at the disposal of the school child, good lighting is one of the cheapest. The *American City Bureau* reported a few years ago that the average cost of teaching each child, per year, was \$57. The average child will reach the eighth grade at the age of 14 years, at a cost of \$456 to the state. If, on account of defective vision caused by poor illumination, or slowness due to lack of visual stimulus, the child reaches only the sixth grade, the cost to the state has been the same, with only three-fourths the result. The state loses money, and the child will probably leave school poorly prepared to earn a living. At an estimated cost of less than \$1.50 per child, per year, good illumination, which would tend to greatly decrease eye troubles and resultant backwardness, can be provided.

Lighting and the Eyes. That defective vision is frequently acquired and is often progressive is shown by the fact that eye troubles are more prevalent among children in the advanced grades. For instance, 10 per cent of the children entering school are near-sighted, while about 33 per cent are near-sighted at the end of their eighth year. That adequate illumination can offset to a great extent the handicap of defective vision was effectively demonstrated in a test conducted on a group of public school children who were decidedly backward in their studies. These children were observed under various intensities of artificial illumination, and a marked increase in mental alertness was noticed as the amount of illumination under which they worked was increased. This improvement in work continued until a maximum illumination, in the neighborhood of 17-foot candles, was reached. The results of this single test are in line with the results of other tests, and indicate that higher standards of illumination are desirable, and that the present standards of illumination for classwork are by no means final and may require future revisions. Progress of the children under the higher standards of illumination was so gratifying that specially lighted classrooms have been installed for their benefit.

Unlike home lighting or office lighting, school lighting is likely to remain unchanged for a long time, even if it is unsatisfactory. The architect must

use care to insure permanent utility by correct design and planning consistent with the needs of the school.

Lighting Requisites. Before entering into any descriptions of the methods of securing proper results in school lighting, it will be well to consider a few of the desirable qualities of good illumination, and then to show by illustrations and data examples of these principles applied to typical buildings. The requirements of lighting are few, but important:

1. Adequate Light. Sufficient illumination for the work at hand; too little light is productive of eyestrain, fatigue and consequent poor work, and may be the cause of permanent eye trouble.
2. Elimination of Glare. This point cannot be over-emphasized.
3. Diffusion. Sharp shadows and harsh contrasts should be carefully avoided.
4. Distribution. This point must receive careful attention if good lighting is to be obtained.

In considering the first point, it is evident that a suitable amount of light must be supplied if work of any kind is to be properly performed. Regardless of what type of lighting system is used, a sufficient amount of light must reach the work,—otherwise the system must be considered as inadequate.

Standards of Intensity. The unit ordinarily used in speaking of the illumination on any surface is the foot-candle (defined as the illumination on a surface normal to a one-candle power source at a distance of 1 foot). This value is measured with a foot-candle meter or other portable photometer. The values given in this table have been found from experience and observation to be desirable standards of illumination of schoolrooms:

Classrooms	8- to 12-foot candles on desks
Study Rooms	10- to 12-foot candles on desks
Offices	10- to 12-foot candles on desks
Drawing Rooms	15- to 25-foot candles on tables
Laboratories	8- to 12-foot candles on tables
Cloak Rooms	1- to 3-foot candles on floors
Corridors	2- to 5-foot candles on floors
Auditoriums	3- to 6-foot candles on floors
Auditoriums (if used for study room purposes)	8- to 12-foot candles on chairs

While such values as given here will produce satisfactory results, the application of the higher rather than the lower values might be advisable. With the higher values of illumination increased perception is obtained, and better results may be expected.

Diffusion and Glare. Sufficient diffusion and the elimination of glare are of importance in any lighting system, yet nowhere are they more important than in the schoolroom. Practically all commercial light sources are far too brilliant to be directly in the field of vision without causing a blinding effect and reducing the ability to see. The construction of our buildings places definite limits upon the heights at which lamps may be hung. We must,



Special Lighting for Pupils with Defective Vision.
Average Illumination, 15-Foot Candles

Guilbert & Betelle, Architects



Room 24x30x13 Feet. Average Illumination of 15-Foot
Candles Is Provided by Eight 300-Watt Lamps

therefore, always reduce the brilliancy of the light sources by means of diffusing globes, shades or reflectors, which either effectively enlarge the light sources or actually hide them from view. Diffusion is necessary in order that shadows be softened and harsh contrasts be eliminated. It is not desirable, however, to go to such an extreme of diffusion as to entirely eliminate shadows, for they are essential in showing the contours or shapes of objects.

The walls, ceilings and woodwork have a very large effect on the efficiency of a lighting system, and upon the way in which the light is distributed. In general, it is advisable to provide walls of a moderate reflection factor, the preferred colors being light gray, light buff, dark cream and some tints of green. Ceilings should have a high reflection factor, either a flat white or light cream color being suitable. In order to eliminate annoying reflections, desk tops and other woodwork should have dull rather than glossy finishes.

Distribution of Light. The fourth point to be considered in designing a lighting system is that of the distribution of light. We have, in general, two extremes,—local lighting and general illumination. In local lighting relatively low-wattage lamps located close to the work furnish a high level of illumination over a small area. Such lighting has very limited applications, none of which are found in the school. A system of local lighting usually abounds in those conditions which cause eye strain and eye fatigue. In general illumination, much larger lamps are used, these lamps being hung as high as possible in order to get them out of the field of view, and in order to provide good distribution. General lighting is, without question, the system best suited to schoolroom lighting. The wiring costs are lower, and the efficiency of the system is higher, due to the fact that higher-wattage lamps are much more efficient than low-wattage lamps. Proper location of outlets insures almost uniform distribution of light throughout the room; in fact, there is possible a much more uniform distribution than with daylight.

This table, taking the light from a 100-watt lamp as unity, indicates the relative amount of light which may be expected from the higher wattage lamps:

100-watt, inside-frosted lamps	1
150- clear lamps.....	1.75
200- " ".....	2.45
300- " ".....	4
500- " ".....	7.2

It is essential that light should be directed on the object to be seen and not directed to the eye; therefore, since it is necessary to hang lamps high and out of the line of sight, we must equip them with reflectors or other devices in order to direct the light to the desk or to the ceiling to be re-directed downward.

Types of Lighting Fixtures. Direct, semi-indirect and totally indirect systems are all employed for school lighting. Each has certain inherent advantages, although they are all satisfactory if properly applied. Ordinarily more outlets are required for direct lighting, in order to obtain proper distribution and diffusion, than are needed for either the semi-indirect or the totally indirect systems. This is offset to some extent by the fact that direct lighting by enclosing diffusing globes is ordinarily more efficient than either of the indirect systems.

Indirect Lighting. Totally indirect lighting produces an extremely good quality of illumination, but it is somewhat less efficient than direct lighting with enclosing globes. In general, the illumination from a totally indirect or semi-indirect installation is about 66 per cent of that which would be produced by a direct lighting installation, using enclosing globes, if the same size and number of lamps were used in each case. A very light colored ceiling is absolutely essential if indirect lighting is to be used to best advantage, since with dark colored walls and ceilings, a larger percentage of light would be absorbed and the over-all efficiency of the installation would be considerably lowered. With indirect lighting there is little possibility of glare, and the resultant light is quite soft and free from shadows; glaring reflec-



Totally Indirect Lighting Provides 10-Foot Candles at Chair-tops



Semi-Indirect Lighting Provided by Four 300-Watt Frosted Lamps

St. John's Law School, Brooklyn

tions are reduced to a minimum, and there are no very severe contrasts to tire the eye. The principal objection to indirect lighting, other than from the standpoint of initial efficiency, is that bowls tend to accumulate dust, making frequent cleaning necessary.

Semi-indirect Lighting. The luminaire employed in this type directs the greater part of the light toward the ceiling (as in the totally indirect system), yet a small portion of the light is permitted to pass downward through opal or frosted glass. This downward light serves the purpose of illuminating the luminaire so that it does not stand out as a dark spot against the lighted ceiling area. The directional quality of this downward light has, in some cases, an added advantage, in that it serves to emphasize to a slight extent shadows which might be wholly lost under totally indirect lighting. Semi-indirect lighting is slightly more efficient than totally indirect lighting. The resultant illumination is well diffused, and such shadows as are produced cause no annoyance. The better forms of semi-indirect units employ dense glass or some other means of reducing the brightness of the lighting unit. This type of lighting is particularly well adapted to schoolrooms, especially if the totally enclosing type of semi-indirect luminaire, of which the upper portion is of clear glass, is used. The open type, semi-indirect units are open to the objections applied to totally indirect luminaire as regards accumulation of dust.

Direct Lighting. Open-bottom direct lighting units are found in many of the older installations. These units are obviously efficient from the standpoint of light output, but their other characteristics are not such as to make them suitable for use in the schoolroom. The diffusion is not of the highest order, and sharp shadows and contrasts are likely to be extremely prevalent. Such units are also objectionable from the standpoint of direct and reflected glare, especially if clear bulb lamps are used. The use of this form of lighting is advisable only where cost must be kept at the absolute minimum, and where secondary consideration is given to the quality of

the light. If such lighting is employed, it is advisable to use dense opal or etched prismatic glass deep bowl reflectors. Such reflectors will not produce an unpleasant glare. Flat type reflectors, of either metal or glass, should never be used in the schoolroom, for it is almost impossible to conceal the lamp filaments from view when this type of equipment is employed. Opaque reflectors, in general, are unsuitable, since the ceiling would be very dark if they were used. Diffusing bowls or white bowl lamps should always be used in preference to clear lamps if open-bottom lighting units are installed.

The enclosing, diffusing, direct lighting luminaire or enclosing globe seems to quite satisfactorily fulfill all of the major requirements of classroom lighting. If the proper type is chosen, a well diffused illumination, free from direct or reflected glare, is produced. With this type of equipment the major portion of the light is directed downward, although a considerable portion is transmitted upward, thus giving a character of illumination somewhat similar to that produced by semi-indirect units. The equipment is easily cleaned, and, in general, does not depreciate as rapidly from dust accumulation as do other fixtures giving comparable qualities of illumination. Of course, cleaning should never be neglected, for it is only from clean lamps and clean accessories that maximum light output is obtained.

Ventilating the Fixture. The question as to whether or not it is necessary to provide ventilation for totally enclosing units is one that has often been raised. The results of carefully conducted tests have indicated that with a sufficiently large radiating surface, in other words the proper size of globe and fixture, ventilation is unnecessary.

Globe Sizes. In making a choice between commercial types of equipment of any one class, there are a number of factors which must be given consideration. With the enclosing globe, one very important element is the brilliance of the glassware. This depends on the character of the glass, the size of the globe, and the wattage of the lamp used. The



Mirrored Glass Reflectors, Recessed, Provide 6-Foot Candles Using 300-Watt Lamps

Guilbert & Betelle, Architects



Prismatic Glass Direct Lighting Luminaries; Illumination 10-Foot Candles

Schenck & Williams, Architects

diffusion should be such that the entire globe will be quite uniformly lighted when the proper size of lamp is used. There should be no bright spots opposite the filament. Assuming that the globe gives good diffusion, the brightness will then depend on the diameter of the globe and the size of the lamp used. Care should be taken to provide globes of a sufficient size to care for the lamp used. Glassware designed for 200-watt lamps will accommodate lower wattage lamps quite nicely, but a globe which might be entirely satisfactory with a 100-watt lamp would probably be unsatisfactory with a 200-watt lamp.

This table indicates the minimum desired diameter of enclosing globes, the diameter to be measured at the point of maximum width:

With 100-	watt lamps.....	12 inches
" 150-	" "	14 "
" 200-	" "	16 "
" 300-500-	" "	18 "

With light colored surroundings there is comparatively little choice between the various fixtures of the type under consideration as to shape, since the light walls and ceilings will be of material assistance in redirecting and diffusing the light. In general, an enclosing globe (of opal glass) will give off the major portion of the light in a direction approximately normal to its greatest projected area. That is, a globe of the stalactite shape will direct the greater portion of its light toward the walls, while a globe of the squat type will be more efficient in directing the light downward. This, of course, does not apply to those luminaires in which distribution of the light is controlled by the use of prisms moulded into the crystal glass body of the luminaire.

Spacing of Luminaires. The location of the luminaire in a classroom as well as in any other room depends upon the dimensions of the room and the type of lighting which is to be used. Indirect and semi-indirect systems permit of a slightly wider spacing than would be satisfactory if enclosing diffusing globes were to be used. With direct lighting from enclosing globes or reflectors, the spacing should

never greatly exceed the hanging height of the luminaire. Ordinarily this spacing may be increased to one and one-half times the hanging height; if semi-indirect or totally indirect lighting is employed, however, it is frequently found that the same spacing is necessary for either direct or indirect lighting. For instance, in a room 21 x 21 feet, with a 13-foot ceiling, four outlets would be essential if good lighting is to be obtained. These four outlets would be necessary with either direct or indirect lighting. They should be spaced on approximately 11-foot centers, about 5 feet from the walls.

The calculation of the sizes of lamps which should be used involves consideration of the type of equipment, the colors of the walls, ceiling and other woodwork, and the dimensions of the room. Direct estimates based upon an assumption of a certain number of watts per square foot of floor area are liable to lead to erroneous results. The flux of light or *lumen* method as set forth in the standard texts on illumination and in the bulletins issued by the large lamp companies, will ordinarily give more accurate results, since it is based on the light output rather than the power consumption of the lamps.

Lighting of Gymnasiums. The lighting of those various rooms other than classrooms which are found in the typical school building presents no especially difficult problems. The high ceiling of the typical gymnasium makes the use of mirrored glass or other efficient light-directing reflectors quite feasible. The equipment should always be provided with suitable guards in order to protect it from possibly injury. It is becoming quite common practice to provide recesses in the ceiling in which lighting equipment may be installed. Care should be taken to avoid glaring light sources, since by their blinding effect they may become the cause of a serious fall or other injury. Shower and locker rooms may be quite adequately lighted by 100-watt lamps in opal bowl reflectors, although high percentages of moisture often necessitate the use of vapor-proof fixtures in the shower rooms.

SANITATION FOR SCHOOL BUILDINGS

BY

A. R. MCGONEGAL

MEMBER AMERICAN SOCIETY OF SANITARY ENGINEERS

THE little old red schoolhouse of fond memory has faded into history, and even its successor, the two- or three-room village school is slowly but surely giving way to the new in school building and administration. The family flivver and the school "bus," cheap, rapid and dependable transports that fairly eat the miles that were too much for sturdy, plodding little feet, have wrought the transformation. Instead of many small township and cross-roads schools, we build a replica of the city school building to care for the entire county, and we bring the children to the school instead of taking the school to the children. Thus centralizing educational facilities, the rural community obtains most or all of the advantages of the city school system.

The rural community school building and the average city school building being alike in their physical aspects, the plumbing systems of the structures will be the same. The basic principles of sanitation as applied to the theory and design of plumbing are the same whether the school be located in Maine, Minnesota, California, Texas or Florida, in a small town or in a great city. There will be slight differences in details to accord with differences in climate, such as protection of pipes. County or small town schools may not have the advantages of a public water or sewer system, but isolated automatic water systems and modern sewage disposal plants take their places, and the plumbing installations in the buildings will be identical. The really immense school structures in some of our larger cities differ from the small town buildings only in size, so that the plumbing requirements of an average school building apply to all.

Site and Sanitation. The county school usually has an advantage over the city school in the matter of site, both as to suitability and amount of ground. It goes without saying that a school should have ample space for light and air on all sides, and it should have, if possible, sufficient playground area to keep the children off the adjacent highways. A suitable location is just off the main traveled thoroughfare, as it is less noisy and the air is less laden with dust and burnt gasoline fumes, but it should be close enough for easy access. If selection is not restricted, there are but four items to consider in a site, and "two of these items are water." As the old saying goes, "good property has water as is, and water as isn't." If a city or community water supply of unquestioned quality and ample quantity is not available, it will be necessary to depend on a well, and if this be the case, the deal for the ground should not be closed until the well has been drilled and the supply found satisfactory. Before drilling the well, it is wise to make a survey of the surrounding property to see that the sanitary arrangements

are such that contamination of the well is not probable in the future. The other water attribute, the "water as isn't," refers to necessity of locating the school on comparatively high, well drained ground, suitable for firm foundations and a dry basement. Low ground and marshy, spongy or waterlogged soils are hardly suitable for school sites from stand-points of either economy or health. The other two basic items are space and accessibility. Space is necessary for light and air, playgrounds, and room for future expansion, which should always be planned at the time the original building is laid out. Accessibility means not only location on a good road near the main artery of travel, but a position near the center of population of the territory served; at the shortest distance from the greatest number of families.

Basements should be well out of ground, with high ceilings, so they will be healthful gathering places in inclement weather and can be used for overflow classrooms in emergency. Outside walls should be dampproofed to grade, even if the site is ordinarily dry. The plumbing of a school, both in design and installation, should be of the very best. This is not only wise from a future repair expense standpoint, but good plumbing begets good care, and if we teach our children what good plumbing is, it makes for the health of not only the children themselves, but of the homes, the neighborhood and the nation. The school toilet rooms should be cleaner than the home arrangements, if possible, and the arrangements of the exposed fixtures and pipes should be neat, substantial and easily kept clean and in repair.

The Locations of Toilet Facilities. Suggestions for locating school toilet facilities in outbuildings are frequently made by those having little knowledge of matters connected with the health requirements of growing children and with difficulties of supervision. Such a location, whether connected with the school building by a corridor or not, adds greatly to the already heavy burden of proper supervision; adds to the expense of heating and ventilation in northern climates; and is a decided disadvantage from a health angle. Ease of access, cleanliness and comfort in responding to nature's requirements make for regularity and full and complete operation, forming a healthful habit which should continue for years to come. Dingy, frequently dirty, outbuildings, damp and cold in inclement weather, are not inviting and consequently are responsible for self-imposed abstinence which may, and undoubtedly often does, result in unnumbered cases of irregular habits and constipation, causing much misery and sickness in after life.

Children are naturally mischievous and are likely to break or mar things within their reach when not

under supervision; so, knowing that one in authority cannot be always in the school toilet rooms, we should accept the fact and contrive to create, as far as possible, conditions which will cause little satisfaction to those on mischief bent. This means having all our toilet room fixtures and equipment of substantial pattern, firmly fastened in place, and with as few exposed nuts, screwheads and other contrivances as possible on which a handy boy can use his jackknife. Rows of closets, urinals and basins should be set along the walls and not out in batteries at the center of the room, so that racing and playing tag around them will be out of the question. Fixtures and partition corners set out in the room seem to be desirable handholds and swinging posts for racing children, and many a standing partition has been torn away time after time, with recurring repair bills. Batteries of fixtures set out in the room also add to the difficulties of supervision by providing shields for those hiding from teachers passing or looking in the door. In general, it is excellent practice to lay out a school toilet room so that every portion of the room is visible from its entrance. It is also a good idea to have the entrance without doors but arranged so that the line of vision from the corridor is obscured as to any fixtures. This arrangement requires some consideration in the ventilation system so that there will always be a current of air from the corridors into the toilet rooms. Either an increased exhaust rate for the toilet room itself over the classroom rate, or definitely ventilating the corridors through the toilet rooms will take care of this.

In buildings of one story and basement it is quite customary to group all toilet facilities in the basement, or to put the boys' toilet there and the girls' toilet immediately above on the main floor, which is somewhat more economical on account of the more compact arrangement of the piping, but the best practice is undoubtedly to provide each floor with its own equipment for each sex.

Provisions for Teachers. Teachers' toilets should be provided, as well as slop or service sinks, on each floor. A kitchenette with a small sink in a rest room will be appreciated by the teachers. Extra drinking fountains should be in the basement playrooms, and pedestal fountains are often installed on the playgrounds and not infrequently in front of the building for use by the general public. Teachers should never be required to use the same fixtures as the pupils, but, on the other hand, good administration requires their presence in the pupils' rooms occasionally, and a way to insure this indirect supervisory effect is to locate fixtures for the teachers' use in private rooms opening from main toilet rooms so they must pass through one to get to the other, though other considerations may outweigh this.

Walls and Floors. Walls and floors of pupils' toilet rooms should be of non-absorbent materials with a finish not easily damaged. Buff, mottled, salt-glazed brick up to a line 7 feet from the floor has

been found very satisfactory. Laid with thinly buttered joints in cement mortar without lime, these brick make a practically non-absorbent wall and one not easily scratched or marred or written on with either pencil or chalk. Ordinary cement-surfaced concrete floors are likely to be spongy and absorb moisture, giving rise to odors around the closet bases and urinals. There are a number of good composition floor materials and concrete floor hardeners on the market which can be laid with the ease of ordinary cement and troweled to a hard, glassy finish which is practically waterproof. A mastic bituminous compound has been successfully used, laid hot and ironed smooth much in the same manner as an asphalt-surfaced street pavement is laid. This material can be surface-heated and ironed smooth again if it has to be cut up or becomes worn or rough in spots.

Partitions. Wooden partition work for toilet room closet enclosures is unsuitable. Even with the best of finish, wood will absorb and will give off odors in time; even the window frames and sash should be metal where possible. There are any number of makes of unit metal closet partitions on the market. The best of these are of ingot iron or copper-bearing steel, all welded panels, factory enameled to resist rust, and they are sturdy and designed so they have small dust-collecting surfaces. Stock sizes include one 4 feet deep by 30 inches on centers, which makes a suitable unit for school work. Doors, if used, should be double-swinging pairs, without bolt or latch, and those with gravity hinges are less likely to get out of order. Doors should be shorter than the partition panels, and the bottoms should be 16 inches from the floor. Some school authorities leave doors off closet stalls altogether, and still others provide them for girls and not for boys, though there seems to be no good reason for the distinction.

Number of Fixtures. The economical number of fixtures to provide for any given condition has been worked out through months of investigation and timing under actual conditions of use. Even bearing in mind that it is customary to recess or dismiss many classes at the same time, the average use and re-use capacity of fixtures is very great, and the final rule is very close to the old 15 to 1 rule in force in many states and cities for factories, schools and similar buildings. This more complete rule is based on modern classes with from 35 to 40 pupils, evenly divided between the sexes, and calls for the schedule of fixtures for each such classroom served:

Boys' toilet room: $\frac{3}{4}$ water closet, $1\frac{1}{4}$ urinal, $\frac{1}{4}$ lavatory;

Girls' toilet: $1\frac{1}{4}$ water closet, $\frac{1}{4}$ lavatory, and $\frac{1}{4}$ drinking fountain in the corridor. If the school is for one sex only, or if the makeup of classes may be expected to differ continually, owing to some special local condition, it is a simple matter of figures to alter the rule to fit.

In following a fixture allowance rule, judgment

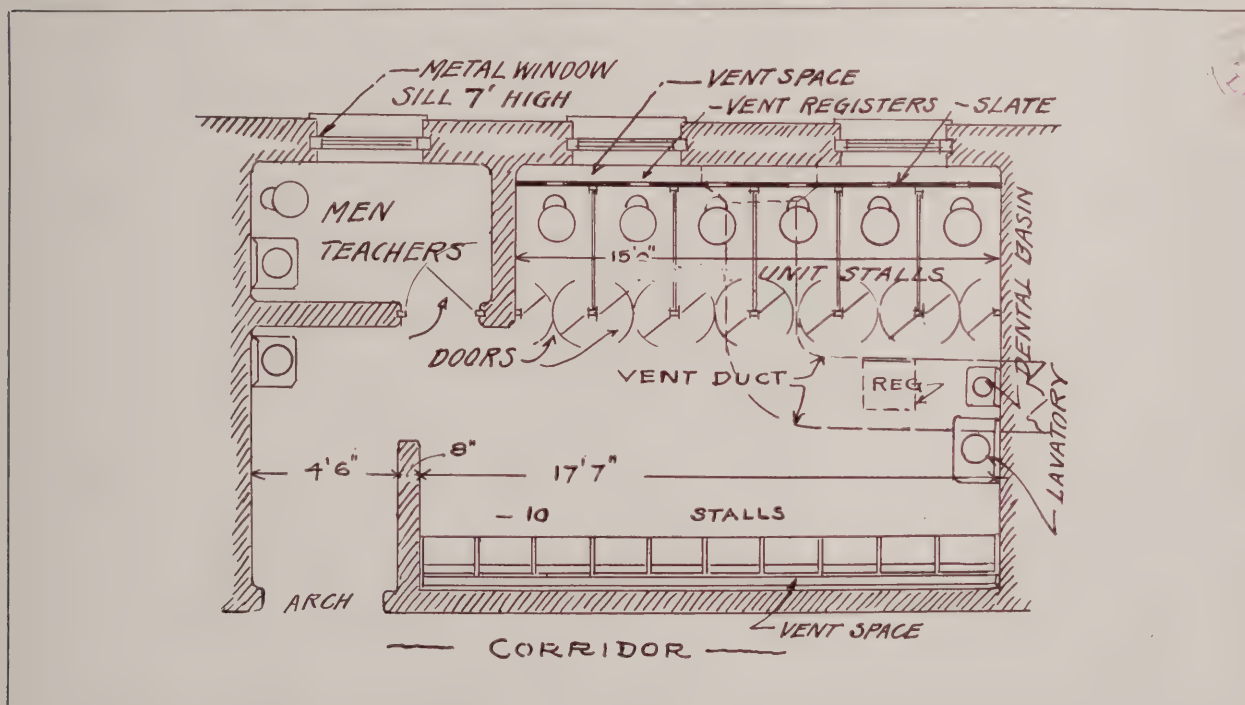
should be exercised when there are an odd number of classrooms to serve, but toilet rooms should be built to fit the fixture requirements and not a number of fixtures provided to fit a room of a set size. It is important that we have a sufficient number of fixtures for proper and reasonable use, but it is just as important that we have no more fixtures than are necessary. Every unnecessary fixture adds to the cost of the building, to the amount of space unavailable for other needed uses, to the water consumption, and to the repair expenses through the years to come. Fixtures, and especially valves and faucets, should be the very best that money can buy. The difference in first cost between a good fixture and a poor fixture is at most only two or three dollars, and the first of many repairs will cost that in plumber's time alone. The good fixture will rarely need repair, and the poor fixture will frequently need attention, and a fixture that is chronically out of order and not usable might just as well not be taking up space.

Water-closets should preferably be of the type automatically operated, as children, especially the younger ones, are exceedingly careless in the matter of flushing. Attached seats must be provided, as integral seats have been tried and found to have a generally unhealthful effect, due to cold flushing water passing through the flushing rim and chilling the body resting on it. One of the largest single items in plumbing repair bills for schools is for taking up and removing obstructions from closet bowls. This can be minimized by using a full siphon jet bowl with a $2\frac{1}{2}$ -inch or $2\frac{3}{4}$ -inch waterway throughout, so that pencils, knives, cloths and dropped articles generally that will go into the bowl

outlet will pass entirely through the trapway to the sewer without hindrance. In some cities the inspector is furnished with a wooden ball which he passes through each closet bowl before setting it, to be sure that the waterway is full size and is clear of obstructions.

There is some controversy over the proper height of the bowl, but good practice seems to point to the regular juvenile height of bowl for all grades. This bowl is $13\frac{1}{2}$ inches from floor to rim and, with $1\frac{1}{2}$ inches added for seat, it is only slightly lower than the average chair, and fits in with the claim often made by medical men that closet bowls should be lower than the usual standard height to provide a more natural and healthful position of the body during use. The seat should be of the comfortable saddle type, open at least in front. Ordinary wooden seats with either a varnish or celluloid finish have not proved very successful for school work, but there are several good composition seats with a minimum of unprotected metalwork to corrode. The solidity and strength of the hinge attachment should be carefully investigated, as well as the quality and fastening of the seat bumpers, the best of which must be replaced from time to time or the flushing rim of the bowl will be broken by slamming seats. Some bumpers cost three times as much as others and are worth it.

Flushing. The flushing should be full and powerful. Pressure flush is the only suitable system for school work, and it can be had in either of two ways, —by compression tank or by direct flush valves. Either type of valve will operate on 15 pounds pressure, but 30 to 40 is better and appears to be general. If direct flush valves are used, the diaphragm



Plan of a Typical Boys' Toilet Room

type which requires no adjustment and is easy to repair can be used to advantage. Such valves, however, require larger supply pipes than are customarily used with tanks, as all the water necessary for the operation of the valve must be furnished during the flushing period of about seven seconds, whereas a tank can be allowed 30 or more seconds to fill between flushes. If pipes are too small, the velocity of flow causes an annoying singing noise, and the valve frequently develops a "hammer" at closing.

Two elements enter into the water supply of fixtures, and in a sense they are independent of pressure, although uninformed people frequently attribute unsatisfactory operation simply to lack of pressure, not realizing that proper flushing depends on volume at the fixture and that just as much water can be delivered by a large pipe at low pressure as by a smaller pipe at high pressure. The two elements are volume and time, and the quantity of water which can be furnished at a given point within the period of the flush is called the "rate of flow." Assuming a five-gallon flush in seven seconds, this means a flow rate of about 40 gallons per minute for a valve closet, but if a pressure tank is used on the closet as a sort of accumulator to collect the five gallons for the short flush, it can be allowed 30 seconds or more to fill, at a flow rate of ten gallons per minute. Thus, other things being equal, any given size of pipe will furnish water for four times as many pressure tank closets as valve closets at the same rate of flow. To properly proportion closet supply mains, all factors should be taken into consideration, and sizes should be figured back toward the source of supply from each closet and each group; but this is too rarely done because of the computation necessary. It is, of course, impossible to be exact without taking into consideration elevation of fixtures, friction loss for length of pipe and the number and character of bends and valves, type of meter, and initial pressure at the source; but the table included here has been worked out as satisfactory with an assumed average for friction loss, an initial pressure of 40 pounds at the source, and a graduated overlapping flush allowance:

Number of flush valve closets allowed on various branch supply sizes

1 or	2 closets	on $1\frac{1}{4}$ " pipe
	3	" " $1\frac{1}{2}$ " "
4 to	6	" " 2" "
7 to	12	" " $2\frac{1}{2}$ " "
13 to	20	" " 3" "
21 to	45	" " 4" "
46 to	75	" " 5" "
76 to	110	" " 6" "

Number of pressure tank closets on other small fixture connections on various pipe sizes

1 to	2 connections	on $\frac{1}{4}$ " pipe
3 to	4	" " 1" "
5 to	8	" " $1\frac{1}{4}$ " "
9 to	12	" " $1\frac{1}{2}$ " "
13 to	25	" " 2" "
26 to	50	" " $2\frac{1}{2}$ " "
51 to	80	" " 3" "

In estimating for urinals with flush valves, two urinals should be figured same as one water closet valve in the first table.

Urinals. There are two types of fixtures most suitable for schoolhouse use,—the vitreous china (not porcelain) stall urinal, and the slate stall type. In either case they should be set down into the floor construction so that the immediately adjacent floor surface grades into a waste trough part. The slate type should be used only where water is plentiful and where a continuous film of flowing water from the overflow flushing troughs can be maintained or an automatic periodic flushing device is used. The vitreous individual stall type should be flushed by a foot-operated flush valve set in the floor. The standard 18-inch width vitreous stall gives really too little shoulder room, even for children, if placed in battery, but if they were made in the 24-inch width, the same as biscuit porcelain, that would give more shoulder room than necessary. The medium of 21 inches on centers seems to be best for all purposes, giving sufficient but no excess shoulder room, economy of space and of cost. The 18-inch stalls as now made must be set 3 inches apart, with a dirt-collecting space, or the spaces must be blocked out, plastered and tiled, thus adding to the expense. Tiling these spaces makes them more sanitary than leaving them open, but not as sanitary as a vitreous unit 21 inches wide would be with its single joint. The slate stall fixture can be obtained in any of the three widths, and is a continuous fixture of practically non-absorbent material. It seems hardly necessary to mention the obsolete enameled iron trough urinal or slate slabs flushed by a perforated pipe. These are, of course, much cheaper than stall unit work, but a saving of money at the expense of sanitary conditions should never be considered.

Floor drains should never be installed in school toilet rooms unless they are provided with a full size vent and have a flushing rim automatically flushed from a tank on the wall two or three times a day. Without this flushing, they are catchalls for sweepings, and the water seal is rarely replenished and evaporates in a month or so, permitting direct entry of sewer air into the toilet rooms.

Lavatories or wash basins should be of substantial pattern with as small a slab size as can be used with an adequate bowl. A small slab has little space for dust collection and offers less inducement to tired boys as a resting place. The fixture should be supported on a leg or legs and have more than ordinarily strong fastenings to the wall, such as 4-inch expansion bolts or lag screws and lead sleeves. Extra-heavy, self-closing basin faucets should be used, so that water cannot be left running by careless pupils. The use of "pop-ups" and other such wastes should be avoided, as they are a constant challenge to the small boy with mechanical ideas. A plug and chain are all that are necessary, and the school authorities should make up their minds in advance that the chain will have to be replaced within a week after opening,

and that rubber plugs of the cheapest kind must be bought by the gross. They are, however, much cheaper than constant repairs and replacements to mechanical wastes.

The cleanest and really the proper way to wash hands is in running water, leaving a free opening to basin waste, but that cannot be done now with the self-closing faucets we have to select from, as all of the practical faucets are quick-closing, and we cannot use a compression faucet without risking much water waste, expenditure of coal or gas in heating water, and danger of splashing or overflow of fixtures. It is quite possible that some of the present slow-closing valves will be perfected to a point where they will be reliable for use on school basins. Dental lavatories are a distinct step in advance, and their provision in schools might teach pupils of an impressionable age that the lavatory is hardly the proper place to spew mouthwashings.

Drinking Fountains. Drinking fountains are of many kinds. The "bubble fountain" has taken the place of the old oaken bucket and the rusty dipper, and there are ring spray-bubblers, vertical- and diagonal-stream bubblers, and single-, double- and multiple-jet patterns. The diagonal-stream devices seem to appeal to one as less liable to contamination, and of this type perhaps one of the best known is the double-jet arrangement where two small jets meet to form a mound for drinking. This device was developed during the war for use in France, where water waste was of moment, and many thousands of the fountains were in satisfactory use there and in the training camps in this country. Water for drinking purposes will generally be found cool enough without refrigeration, unless the mains are laid shallow in warm climates, where the water comes from warmed tanks, or where for some other reason the temperature is higher than it would be from wells or from properly laid mains. Drinking water of icy temperature is unhealthful, and for ordinary drinking purposes it should not be colder than 45 or 50 degrees. This subject has been given much study by mill and factory medical men, and proper control of drinking water temperature is reported as greatly reducing layoffs on account of stomach troubles induced by drinking very cold water when in a heated condition. The same considerations apply to children drinking after a strenuous play period. If it is found advisable to cool the water, it should be done by a central refrigerating plant, controlled by a thermostat, instead of by introducing ice into the water.

One difficulty with diagonal-stream fountains is their response to variations in pressure by changing the height of the stream every time pressure is lowered in the lines by flushing several fixtures. This can be avoided by passing all drinking fountain supply through a water pressure regulator and reducing the supply to them to a point where variations will not drop below the setting of the regulator. In connection with the pressure-reducing valve, a

sand trap is often installed to screen out any foreign matter in the water.

Hot water should be supplied to all lavatories, together with liquid or powdered soap and paper towels, as children will not wash in discomfort or without soap and means of drying. The hot water supply should be of the instantaneous type, or the equipment should provide large storage capacity with a comparatively small heater, as the total use is spread over about four hours out of the 24 and nearly all during some three or four 15-minute periods. A circulating return will tend to save much water, though it will require more coal or gas to operate. In case special kindergarten toilets are wanted, siphon-jet infant-size closet bowls can be had with heights of 8½ or 9 inches, and lavatories can be set 2 feet from the floor instead of at the regular height.

Fire Protection. Fire standpipes, although used extensively in school buildings, are rarely considered a necessity. In some localities rates may make their installation desirable financially, but generally all modern school buildings are fireproof up to the ceiling lines of the top floors, and a judicious distribution of extinguishers, taking care that they are periodically charged, will take care of any minor fire until the arrival of fire apparatus. Teachers should not be charged with fire fighting or anything that will take their minds from their most important duty, that of getting the children out. In case the building is in a country town with little or no fire department and without a pressure water supply, several hydrants in the school grounds attached to the school water system are much to be preferred to interior standpipes. These hydrants should be 50 or more feet from the walls of the building, so that fire heat may not prevent servicing them, and the hose should be kept in an outbuilding. If the school has an auditorium with stage space for scenery, an automatic sprinkler system should be provided beneath and over the stage, in all dressing rooms, and in all stage property storage rooms. It is good practice to have the asbestos fire curtain operate on a "trigger connection," so that if there is a lack of pressure the curtain cannot be raised for a performance, and if the pressure drops dangerously low, the curtain will come down of its own accord.

Piping. The plumbing piping system should be of the best. The materials and workmanship should be such that the plumbing installation will last for the reasonably-to-be-expected life of the building. This does not mean the entire structural life but until the condition of the entire building and plant is such that it becomes necessary to remodel. It is safe to say that this period will be at least 30 years and may be 50. Therefore, care should be taken not to bury in floor or wall construction any material of shorter life, and to see that all valves or other parts requiring repair or replacement are left, together with their connections, in accessible positions. It pays to use a heavier grade of fittings of galvanized iron or brass pipe than would ordinarily be specified,

and to have all waste and soil pipe fittings of the long radius pattern to avoid the possibility of obstructions' building up. Probably extra-heavy cast iron soil pipe will have longer life than galvanized iron pipe. Some engineers prefer genuine galvanized wrought iron in place of the soft steel pipes of commercial grades. Brass pipe answers the need for long life water pipe where it is concealed, but galvanized iron, of a larger size to take care of inside corrosion, may last if it is painted and given a protective wrapping. Pure copper tubing is used to some extent, is much cheaper than iron pipe gauge brass pipe, and it is flexible and easily worked.

All water piping, whether concealed or exposed, should be covered with asbestos or hair felt covering. This protects the pipe from corrosion through contact with building materials such as mortars and concrete, minimizes loss of heat in hot water piping, and prevents condensation on the cold water lines. It also prevents, to some extent, noises due to pipe vibrations, though it is good practice to install shock absorbers at strategic points to take care of water hammer if it does develop. Each main water line in the basement should be painted its distinctive color, and all valves should be tagged. The plumbing system should be adequately vented, the fixture wastes having individual vents or being connected on a circuit or loop vent in accordance with modern practice. If the state, city or town has no plumbing code, the "Hoover Code*" requirements should be strictly adhered to.

Special Pipe. Wastes from chemical and physical laboratory sinks should never be connected to the general plumbing system of the building, and they should be run exposed for easy inspection and repair unless the waste lines are constructed of pipe proof against the commonly used acids. Special pipe for acid work can be had in several materials, such as a composition of hard rubber, stoneware, china, lead-lined iron, and cast iron with a high silicon content. They are all hard to work, and the fittings of some are cumbersome, but the silicon iron, being so similar to the cast iron soil pipe used elsewhere in the system, probably will be most satisfactory. In using this, or any acid-resisting pipe, joints are weak points, and special asbestos jointing material must be used.

Valves. Too much stress cannot be laid on quality of valves. They vary widely in price, but the best will be found much cheaper in the end. Globe valves should be used sparingly on account of their resistance to flow which is about 20 times

as much as for the same size gate valve under equal conditions of pressure and rate of flow. It is best to select the make of valve to be used and have the same make throughout the work. All valves in rooms to which pupils have access should be of the lock shield, removable handle type, which cannot be meddled with.

Pumps and Tanks. If a pressure water supply is not available, then a pumping system and an elevated tank may be used, but as satisfactory operation of valve closets depends on a head of 35 or 40 feet above the topmost fixtures, a pressure tank layout will be found more serviceable and less costly. A proper size tank would hold not less than 400 gallons per classroom in combined air and water. The tank (or tanks) may be heavily coated with protective paint and buried in the ground with just the head and connections exposed in the basement. Gauge glasses as well as pressure gauges should be provided, and a dependable relief valve is a necessity whether there is one on the pump or not. Good practice is to have a separate air pump instead of relying on the snifter valve usually furnished on the water pump, as it places better control in the hands of the operator. Automatic intakes on pumps are almost always furnishing either too much or too little air, and trouble with the system results either way. Unfortunately, centrifugal pumps cannot always be used on wells and pump heads, and jacks are noisy and the monotony of their pound has a bad effect on school work. If deep well work is necessary, an air lift system will be found best, although more expensive.

Sewage Disposal. In the absence of a public sewer system, a sewage-disposal plant is a necessity. A leeching cesspool is an abomination and should never be considered, even if the law is loose enough to permit it. What is usually called a septic tank will answer for the preliminary treatment of reducing the sewage to a liquid form, but even in the design of this there is the difficulty that the quantity of sewage to be treated varies greatly. The plant must normally work five days and be idle two, and there are several short and one long vacation, and stale sewage will not respond readily to secondary or purifying treatment. This intermittent use also tends to sludge up the tanks excessively, but as the tank must be desludged each fall anyway, this condition only adds to the size.

A two-or three-part concrete tank of rectangular shape is generally used, although a much smaller unit built on the Imhof principle will occupy less space and possibly will cost less to build. The Imhof pattern has the advantage of quickly clearing of stale sewage on occasion, the mat area is small, and removal of sludge is easier.

*The so-called "Hoover Code" is published by the U. S. Department of Commerce under the title of "Recommended Minimum Requirements for Plumbing in Dwellings and Similar Buildings." It can be obtained from the Superintendent of Documents, Government Printing Office, Washington, for 35 cents, cash or money order; checks or stamps are not acceptable.

SCHOOL FINANCING AND THE ARCHITECT

BY

C. STANLEY TAYLOR

AT first thought it might seem that the architect would have no particular interest in the question of financing school building projects.

The reason that the architect's relation to the financing of school buildings is becoming of paramount importance is because the nature of such financing invariably establishes an almost absolute cost limit or budget for the building operation. It is quite unnecessary to go into details regarding the types of school bonds or the methods of taxation. The important point for the architect to consider is that a bond issue, a special tax, or an endowment, prescribes a definite sum of money which should not be exceeded by the cost of the land, building and equipment. Last year an extensive survey was made by the Better Schools League, Inc., of Chicago. So many valuable facts were developed in the course of this survey that it is drawn upon freely in the development of this article.

Costs and Appropriations. The Better Schools League survey brought out some very interesting information in relation to the question of construction and equipment costs' exceeding bond issues or appropriated funds. In 350 cities which erected school buildings within the past five years, 22 per cent of them over-spent the bond issues or appropriations. The results of incurring building and equipment costs which exceed appropriations are always unfortunate, and in many cases the architect is directly charged with the responsibility. In the first place, if there is an excess cost, the community is forced to issue warrants bearing high rates of interest. In many communities this practice is not legal, and the only thing that can be done where the construction cost is excessive is to curtail definitely the finishing and equipping of the building. Old equipment may be substituted for new, and in every way the final structure will be inferior, according to present-day standards. This situation may also lead to instructing important extra-curricular activities,—music, art, industrial arts, gymnasium and playground activities. Under these conditions also it becomes impossible to develop the school as a community center and to provide the various facilities necessary to contribute to community life. It becomes quite evident, then, that the architect's relation to financing has much to do with developing a building which will unquestionably come within the construction budget. The fact is, however, that this relationship should logically begin at the earliest stage, when the project of a new school building is first contemplated and before any bond issue or appropriation is established. An architect should be called upon at this stage to investigate the school requirements and with rough preliminary plans to indicate to city officials or the school board how

much money is really necessary for the building and its equipment.

The Fixed Budget. This question of developing plans within fixed budget limitations offers in itself a series of problems which must be solved in a practical manner by the architect. The first temptation, of course, is to establish construction and equipment cost savings through the use of less expensive materials, and perhaps through simplified planning. This is a logical way to bring down the cost of a building of any kind, but at the same time it is a very dangerous procedure unless practical minimum standards are set. It must be remembered that school buildings are built to serve the community for a great many years and in the most efficient possible manner.

The information which follows is presented primarily as a guide to the architect who undertakes school work. It gives some very definite information as to the cost of the construction of schools of various kinds and also shows at least one recommended method of establishing the related budget of equipment cost as compared with the total building cost. The data have been taken from last year's survey by the Better Schools League, Inc.

Ratios of Building to Equipment Costs. General experience with the school equipment budget indicates that it should be established as an entirely separate fund upon which the building cost itself should not encroach. Reports received by the Better Schools League from 350 cities which have erected school buildings since the year 1923 showed a very consistent ratio of the percentage of the bond issue which should go into the building proper and that which should go into equipment. The experience of this group provides a basic standard of average practice. The summary for the different types of school buildings is indicated here. It may be noted that school buildings throughout are classified according to the grades housed in the structures. Thus, grades 1 to 8 represent the average elementary school; grades 1 to 9 represent elementary and junior high school combined; grades 1 to 12 represent elementary and high school combined; 7 to 9 junior high school; 7 to 12 junior and senior high school; 9 to 12 regular high school; and 10 to 12 senior high school. The term "upper 50 per cent" is also used, indicating the finer standards of modern construction and equipment, so that the general figures given represent average practice, but those labeled "upper 50 per cent" represent the practice of the better-than-average group.

According to analyses in 350 cities, in school buildings housing grades 1 to 6, the average equipment cost was 8.2 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of bond issue

going into equipment, was 11.2 per cent. In school buildings housing grades 1 to 8 the equipment cost was 10 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of bond issue going into equipment, was 13.7 per cent.

In school buildings housing grades 1 to 9 (elementary and junior high school combined) the equipment cost was 13.6 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of bond issue going into equipment, was 19.2 per cent. In school structures housing grades 1 to 12 the equipment cost was 14 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of the bond issue going into equipment, was 18.3 per cent. In buildings housing grades 7 to 9 (junior high school) the equipment cost was 10 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of the bond issue going into equipment, was 12.5 per cent. In school buildings housing grades 7 to 12 (junior and senior high schools combined) the equipment cost was 12.2 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of the bond issue going into equipment, was 18.5 per cent. In buildings housing grades 10 to 12 (senior high school) the equipment cost was 16.6 per cent of the bond issue or appropriated funds. The average of the upper 50 per cent, classified on the basis of per cent of the bond issue going into equipment, was 22.6 per cent.

On the basis of these averages, a table of budgeting,—assuming the building and equipment cost \$300,000.00,—would be:

Budget for School Building and Equipment			
To House		Cost of	Cost of
		Equipment	Building
Grades	1-6	\$24,600	\$275,400
"	1-8	30,000	270,000
"	1-9	40,800	259,200
"	1-12	42,000	258,000
"	7-9	30,000	270,000
"	7-12	36,600	263,400
"	9-12	45,000	255,000
"	10-12	49,800	250,200

It is manifestly difficult to lay down a definite and established ratio between the cost of the building and the cost of equipment. The average for the junior high school is low in comparison with others, possibly because it is a new institution, and its needs therefore, not so well standardized. The averages given here show the general trend and afford local school officials an opportunity to check their own school costs against the general averages.

For those who are interested in knowing what the "upper 50 per cent" or better than average groups

are doing, this table indicates the allocation of the total budget for a school building project,—assuming again the cost of building and equipment to be \$300,000.

AVERAGES FOR "UPPER 50 PER CENT"

Budget for School Building and Equipment

To House		Cost of	Cost of
		Equipment	Building
Grades	1-6	\$33,600	\$266,400
"	1-8	41,100	258,900
"	1-9	57,600	242,400
"	1-12	54,900	245,100
"	7-9	37,500	262,500
"	7-12	47,100	252,900
"	9-12	55,500	244,500
"	10-12	67,800	232,200

Survey of Actual Costs. Returning again to the question of school building costs, the most reliable data was received by the Better Schools League, Inc., 53 West Jackson Boulevard, Chicago, in the course of their extensive cost investigation. In this survey will be found a detailed list of actual school building projects, giving in all cases the essential data, including cost per pupil and in many cases the actual cost per cubic foot. Of the various buildings on which costs are given, 228 are of fire-resistive construction; 94 are of the slow-burning type of construction; and 5 have practically no structural safeguards against fire. The tabulations give in the first column the type of school described by grades housed in the structure. The meaning of these various grades has already been presented in preceding paragraphs. The second column gives the year of construction; the third gives the maximum pupil capacity; the fourth gives the cost per pupil; and the fifth gives the cubic foot cost in cases where costs are available. These figures are conveniently divided into various states. They will unquestionably serve as a general basis for comparative cost estimating. It must be realized, of course, that cubic foot cost data have definite variations and limitations, and that the same structure in one locality may cost more or less than in another. The building that costs \$300 per pupil may provide twice as much in the way of facilities of an auditorium, gymnasium, laboratories, etc., as the structure costing \$150 per pupil, so that it is not safe to assume that the school built at lower cost is necessarily the most efficiently designed. The opposite may be the case.

EDITOR'S NOTE—The full tabulation of school building costs, arranged according to the type of school, the year constructed, the pupil capacity, the cost per pupil and the cost per cubic foot, is published in a booklet entitled, "School Construction Costs and Equipment Budget." This booklet, which is described by Mr. Taylor, is published by The Better Schools League, Inc., 53 West Jackson Boulevard, Chicago, and is the result of an investigation which covered reports from 350 cities which have erected school buildings within the past five years.

COSTS AND CONSTRUCTION

BY

IRWIN T. CATHERINE

ARCHITECT, SCHOOL DISTRICT OF PHILADELPHIA

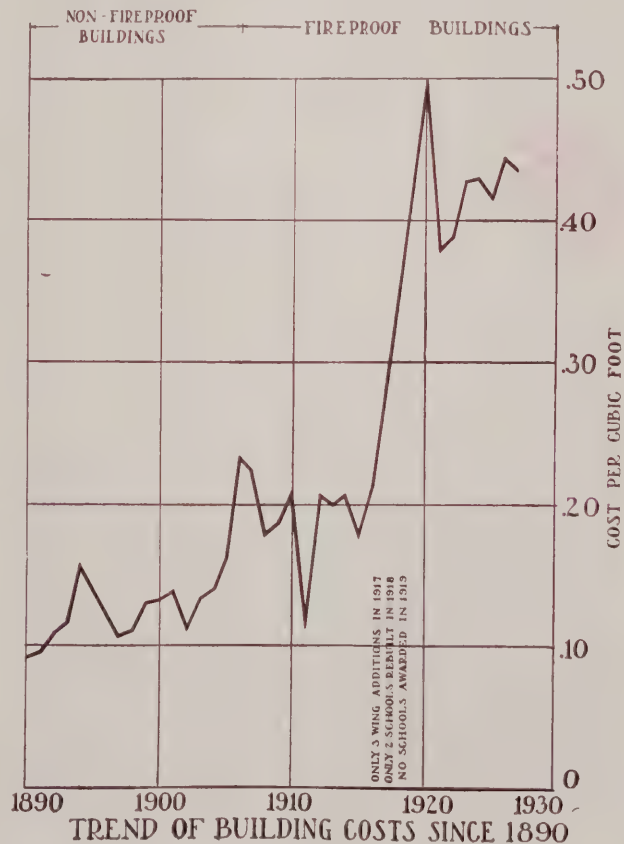
DURING the year 1905 and subsequent years, school buildings, when finances made it possible, have been constructed of fire-resisting materials, using the wall-bearing type of construction, which in more recent years has made way for the column-bearing type,—a more economical and practical form of construction. This change in design has been greatly augmented by the great number of school buildings that have been destroyed by fire. Statistics show, even in this modern age when everything is being done to preserve human life, that a great number of school buildings of all sizes throughout the country are still being constructed of non-fire-resisting materials and that on every day in the year, approximately five such buildings are burned to the ground. This is not confined to buildings erected during the early part of our educational development, but includes some constructed during recent years. The desire to reduce fire losses to the minimum, together with new standards of higher education and laws enacted by the legislatures of the different states, has resulted in the development of the modern school building.

Costs. Some elementary schools completed during the latter part of 1927 in one of the large cities at a cost of approximately \$543,000 each were designed of concrete with full column-bearing type construction and had in general 35 class units, including shops, recreation rooms, auditoriums, doctors' rooms and boys' and girls' interior toilets on each floor. Buildings are now completed in their entirety within 12 months from dates of awards, which would not have been possible had wall-bearing construction been used. A senior high school completed during the early part of 1927 at a cost of \$2,170,191 of construction similar to that of the elementary schools, included over 100 class units, among which were units for the study of chemistry, physics, art, mechanical drawing, home economics, physical training, manual training, music, botany and others too numerous to mention. Within this building are also to be found a large auditorium, up-to-date administrative offices, toilets and rest rooms.

The constant change in ideas for the educational requirements of the child, together with new building laws, has kept the designers of school buildings on the alert in order to keep pace with the latest developments. As a result, many new details have been introduced in construction and design that would not otherwise have occurred. It is interesting to note the mounting cost per cubic foot of buildings of this class from 1890 to date, as indicated on the diagrammatic chart shown on this page. The rising prices can be attributed to increased cost of labor and materials and to the greater amount of materials being

added to each cubic foot of space as the educational system develops, with a simultaneous elaboration and beautification of the exteriors of the buildings. Much study has been given to every part of the building in order that the cost of installation might be reduced to a minimum consistent with good design.

Economy of Space. There has been a great advance in what is known as concrete column construction, using spandrel beams to support exterior and interior walls. This type of construction provides saving in space, economy in construction and rigidity and rapidity of erection over the former wall-bearing type. The skeleton-frame type of construction allows a reduction in the gross area as well as the total height of building. This is very evident by referring to the illustration of "Comparative Types" which shows three systems of concrete construction. In the use of 13-inch curtain walls and 4-inch tile partitions one can readily visualize the saving in total area, which is often as much as 3 per cent. By reason of the shallow floor construction and the omission of the large factory-like windows sometimes placed in school buildings, about 5 or 6 feet may be saved in the total height of a three-story building, which may permit a total reduction in the cubage of the building of approximately 10 per cent.



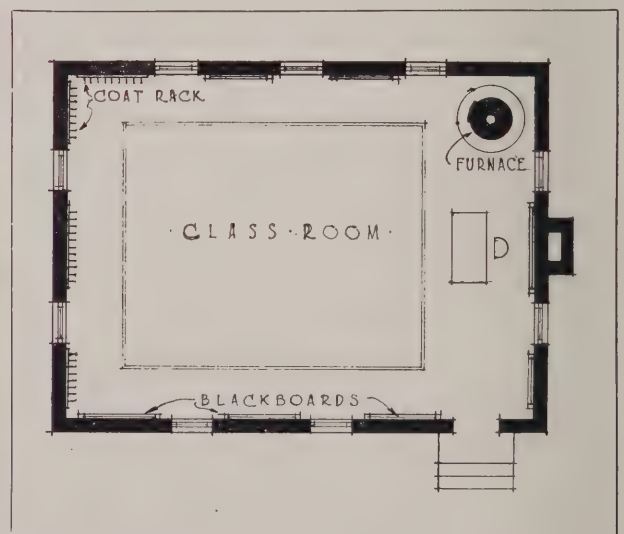


Typical Junior High School, Completed 1927. Cost Per Cubic Foot, 43 Cents. Cost Per Pupil, \$608. Pupil Capacity, 2040

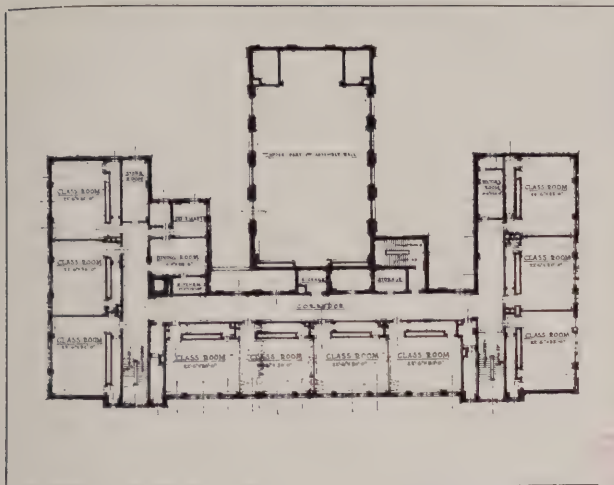
This reduction in cubage, however, is not so evident in the cost per cubic foot as in the total cost of the building and the cost per pupil. This theory is proved by the example of a school recently constructed without an auditorium, where the per cubic foot cost was 42 cents, with the per-pupil cost as low as \$253. Here the plan was rectangular and had no waste areas. On the other hand, in another building, having an auditorium, the cubic foot cost was 43 cents, while the cost per pupil was \$345. Thus, while the increase in the per-cubic-foot cost due to the inclusion of the auditorium is but $2\frac{1}{2}$ per cent, the increase per-pupil cost is more than 36 per cent.

Rapidity of Construction. Rapidity in construction is an important factor in the building of schools, and this is best accomplished when all trades can

proceed independently of one another and without interference of any kind. This is better accomplished with the skeleton form of construction than with the wall-bearing, for the reason that floor after floor can proceed without waiting for bricklayers and other sub-contractors to get on the site. The solid concrete floors and stairs become a protection to workmen against weather and accidents, and facilitate the movement of materials and labor as soon as this portion of the work is completed. School buildings with a cubage of over 1,000,000 cubic feet have been completed and fully equipped within a period of from nine to ten months after the work was started. The rapidity of construction resulting from the use of this type is closely allied with economy in construction, so that owner and contractor are always



A One-Room School Building of 1820



Typical Elementary School, Completed 1927

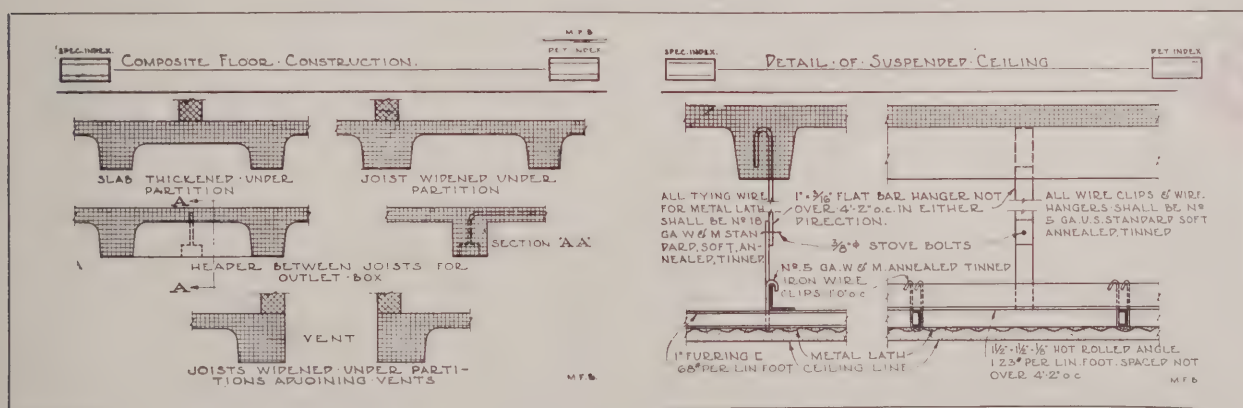
the principal beneficiaries, as indeed they should be.

Rigidity of Construction. One of the most important qualities in the use of concrete is the rigidity that is secured by the skeleton type of construction. It is very important that the vibrations caused by children marching or drilling should not be transmitted to the classrooms, and that the noise and motion of the gymnasium should not in any way disturb the auditorium exercises. The rigidity of the concrete skeleton frame building gives assurance and satisfaction in a heavy wind storm such as have been experienced recently in many parts of the country. In connection with these wind storms, it will be noticed that wherever loss of life has occurred from a collapse, the building was of the wall-bearing type.

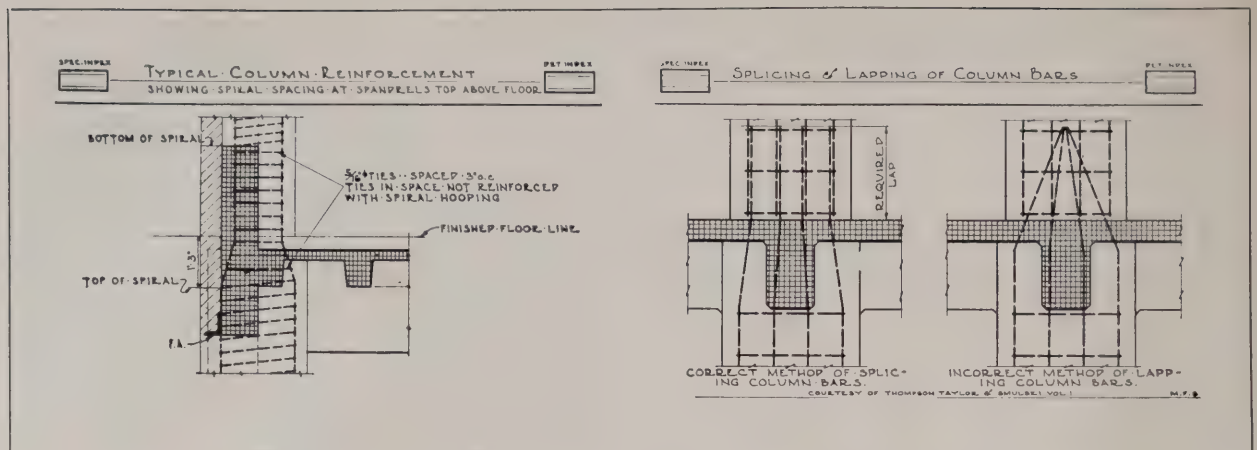
Economy of Construction. Since the adoption of the full skeleton type of construction, many buildings have been erected of the reinforced concrete skeleton type. Using this, it has been possible to complete and fully equip \$500,000 buildings in ten months, when it once took twice that time. Study and research have made it possible to standardize certain drawings and details, with the result that within 24 hours after a contract is awarded practically 80 per cent of the details required for the building can be issued to contractors. In this way there is no wasteful and expensive delay, and the

contractor is able to reduce his own overhead charges.

Details of Construction. The details of construction here shown may be considered typical for this kind of building. In general, classrooms are 30 feet long in the clear, so that the spacing of columns is 15 feet, 2 inches. The floor and roof construction is formed of 5¾-inch wide concrete joists (usually 8½ inches deep), 26 inches on centers, with slabs 2½ inches thick. This floor, known as "composite" construction, is framed to a large girder 16 inches wide by 26 inches deep, having a span of 23 feet, with a wide tee, which runs from column to column across the width of the room (Diagram page 474). The slabs and joists, in the schools just mentioned, are "formed up" by the use of No. 12 gauge removable steel forms, which may be removed two to four days after the concrete is placed, providing the supports under the joists are left in place. This permits the continuous use of the forms, so that a comparatively small quantity will be sufficient for the entire building. There are various other satisfactory types of concrete floor construction, such as terra cotta or light hollow concrete blocks spaced so as to form the rib beams, flat slab construction reinforced in various ways, etc. The finished ceilings of the classrooms, corridors, and other rooms are formed by expanded metal lath suspended beneath the soffits



Typical Details of Construction Used in Connection with the Specifications

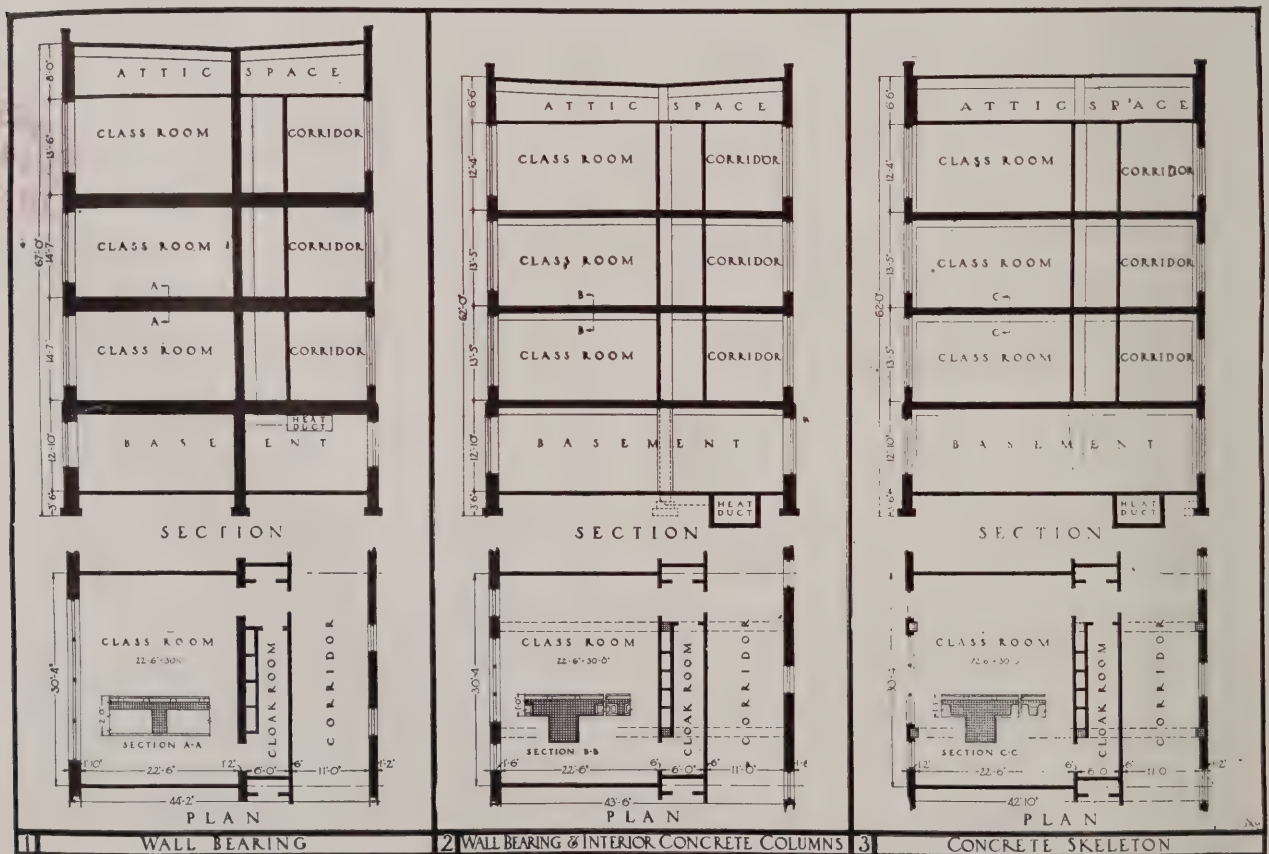


Typical Details of Construction as Issued by the School Architect

of these joists and plastered with the usual three-coat work. The ceilings of the upper stories are formed in a similar manner, supported on channels or angles which are suspended several feet below the roof construction. The space between the roof and the ceiling below is useful for the steam pipes and ventilating ducts which are so necessary in large school buildings. (See illustration "Comparative Types," below.) All exterior walls are of face-brick veneer with a backing of a hollow tile or common brick supported at each floor on concrete spandrel beams, which are framed monolithically with the floor, girder and column construction. An important feature of the construction is the all-con-

crete stairways which are poured with the floor construction, providing safe and easy access to all floors.

It is almost impossible to imagine what changes will occur in school buildings which may be erected during the next 100 years, considering the great changes that have developed during the past hundred. Will they be huge structures, three and four times the sizes of the present buildings, or will education, like all other enterprises and developments, reach a "saturation" point? The writer believes that there will come a time when the mechanical activities will be removed to special trade schools, and that the new education in these buildings will revert to that of the "three R's" of a more advanced standard.



Comparative Types of Construction

SPECIFICATIONS FOR THE SCHOOL BUILDING

BY

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THE "Tentative Contract Forms" submitted by the Interdepartmental Board of Contracts and Adjustment of the Bureau of the Budget, U. S. Government, contains this excellent definition of public and private contracts:

"1. All public contracts are made by agents with limited authority. Their authority is governed and controlled by the laws under which they are authorized to act.

"2. It is a well established public policy that all public contracts shall be let after open and free competition to the lowest responsible bidder, and that, in order to accomplish this result and have competition based on uniform terms, the government, states, counties and municipalities must dictate the terms and conditions that must be met by the bidder.

"3. In order to carry out this public policy it is necessary that the contracts shall be carried out and performed in substantial compliance with the terms and conditions under which they are let. No officer of the government, or of a state, county or municipality, has the right to vary the terms or waive the rights accruing under such contract. In private business, however, the individual awarding the contract can do what he pleases with his own money or his own property, and he can select his own contractor upon his own terms. He is free to order any changes he may desire to have made in the contract and to make any kind of settlement he can arrange with the contractor after performance has been completed."

A contract for a public school is a public contract, subject to the restrictions quoted. There are some municipalities and school districts where a public school contract may be legally handled as a private contract. In these cases it is generally considered for the best interests of the public to handle them essentially as described for public contracts.

A close contact with public contracts over a period of years reveals the fact that the element of "good will" is absent in this class of work, and there appears to be a good reason for this condition of affairs. "The lowest responsible bidder" is an elastic term, which includes generally all not in receivership or jail. This state of affairs is due largely to the surety companies, which seem willing to furnish bonds to anyone able to pay their fees. When a surety company guarantees the responsibility of the contractor, the school board is in effect denied the right to judgment which the law intended. A public contract is awarded as the result of a "free for all" upon a strictly price basis, and the successful bidder generally feels that the contract was awarded without regard to ability, character, integrity or financial responsibility, and, therefore, he is entitled to take advantage of all of the "breaks," errors, misinter-

pretations and omissions, and will create as many of these to further his own interests as possible. The specification writer should be thoroughly familiar with the effect of public bidding and the lack of "good will," and he should erect a defense against the evils resulting from open bidding and the lack of "good will." In order to effectively carry out the policy and conditions defined for public contracts, it is necessary to include in the specifications requirements and conditions peculiar to this class of work. An attempt has been made in this article to restrict the discussion to those questions which require special treatment in public contracts, and no attempt will be made to cover questions which are encountered in specifications for the average work.

Advertisement: The advertisement is generally included as part of the contract documents and should, therefore, be prepared by the architect. The advertisement is the concrete expression of "open bidding" and is required to insure such bidding. Certain municipalities and school districts have requirements which differ from others, and the specification writer should consult the secretary of the school board before preparing it. The advertisement should state briefly when and where the bids will be received, the character and size of the project, the number of contracts, the deposit required to guarantee the bid, and whether it will be a certified check, bid bond or cash; also where plans can be obtained for estimating purposes and the deposit required for them. The advertisement should be included as part of the specifications and a copy turned over to the secretary of the school board for insertion in the papers. When this detail is handled by the architect, he should look up the law, as it varies not only in different states, but also in different municipalities and school districts.

Proposal Form. In order to carry out the policy of dictating all of the requirements and conditions that must be met by the bidder, and to insure the bids being received on exactly the same basis, the proposal form is always included. The proposed form should be prepared by the specification writer and is either included in the specifications or as a loose form with the specifications. The proposal form simplifies the public reading of bids and becomes part and parcel of the contract documents. The proposal form should be made out in complete detail, so that it will only be necessary for the bidder to fill in the amounts and sign it. When alternative estimates and separate estimates are required, the exact wording of each should be on the proposal form, so that it will be necessary to fill in only the amount. The courts have ruled that optional alternative bids which deal with a system or method

different than that specified are illegal, due to the fact that the other bidders did not have the opportunity to estimate upon the same basis. For this reason proposal forms which request the bidder to name the time of completion have been held illegal because all bids were not on the same basis.

Deposit Guaranteeing the Bid. In order to prevent fraud in public work, a deposit is required with the bid guaranteeing that the bidder will execute the contract if it is awarded to him. The deposit may be cash, certified check or bid bond, and the amount required will generally vary from 2 to 10 per cent of the amount of the bid, depending upon the amount of money involved. A bid bond is furnished by a surety company for a nominal fee as an accommodation, and as such they expect to receive the contract surety bond if the bidder be awarded the contract. Some school boards will not approve some surety companies, and in order to prevent the necessity of disapproving a surety company after it has guaranteed the bid of a successful bidder, they refuse to accept bid bonds as deposits and demand certified checks or cash. To prevent issuing certified checks upon weak banks, some school boards require that the certified check be made upon a member bank of the Federal Reserve System, as a bank must qualify before being accepted as a member. It is usual to require all bids to hold good for 30 days after their receipt, and to require the retaining of the deposits of the three low bidders on each class of work until the contract is executed. As the deposit is frequently 5 per cent of the bid, this means that this amount is deposited without interest with the school board for this period of time. Some school boards do not request funds for building purposes from the public or board of school estimate until the bids are received, and it is manifestly unfair to tie up the liquid funds of an unsuccessful bidder for 30 or 40 days without interest.

Surety Bond. A bond guaranteeing the performance of the contract is required from the successful bidder and is a legal requirement of all public contracts. Personal bonds are legally acceptable in most states, but owing to the liability of the individual members of the school board, if the contractor should default and the security prove worthless, this class of bonds is rarely accepted. Practically all bonds are executed by companies which make a business of this class of risks. The fees for surety bonds are generally fixed by law, and the surety companies are generally licensed by the state before they can do business in that state. They are also required to deposit a percentage of their capital in the state treasury, the amount of the deposit being based upon the amount of business done. Some states legally define the liabilities which the surety company must assume, irrespective of the particular bond form it may have executed. One may often feel secure in the knowledge that he has protected the owner, sub-contractor and materialman, by a cleverly worded and legally executed bond form, but may learn later

that the state law has limited the liabilities of the bonding company to such an extent as to make it practically valueless. In New Jersey, the surety bond protects not only the owner, but the sub-contractors and materialmen. This is as it should be in building construction, owing to the fact that the contractor in this class of work is in effect a broker, who can easily shift his liabilities to the shoulders of the sub-contractors and materialmen, and let them "hold the bag." Such a condition of affairs exists in the state of New York, and it encourages fraud. The surety companies in New York are responsible to the owner only. The general contractor can finance a project from the sub-contractors' funds, collect at completion, and as long as he does not default to the owner the surety companies are not involved.

Qualifying as a Responsible Bidder. In a creditable attempt to take the definition of a responsible bidder out of the hands of the surety companies and to correct some of the evils of public bidding, the Joint Conference on Construction Practices, at Washington, has compiled standard questionnaires and financial statements which when executed should form a good basis on which to establish the proposed bidder's responsibility. The forms consist of an experience questionnaire, plan questionnaire and financial statement, and appear to be a step in the right direction.

General Conditions

Liquidated Damages. The General Conditions for a school building will vary from that used for a private project, due to the fact that all of the conditions and requirements must be decided beforehand and definitely specified, with nothing left to future negotiation. For example, the time of completion should always be given, so that all bids will be received on exactly the same basis. The amount of liquidated damages should be given, with detailed conditions under which the time will be extended. If the operation is awarded under different contracts the liquidated damages are more difficult to collect, but even under these conditions the amount has been collected. The amount of liquidated damages that the school board will stand is not in direct relation to the amount of the contract price of the building. Should the time of completion coincide with the beginning of the fall school term, the liquidated damages should be greater than if the time of completion were at the beginning of the summer vacation period. If a school addition or alteration is contracted for and if it affects the operation of the present building, the amount of liquidated damages incurred would be proportionally greater than if the building were a complete unit in itself. These facts should be considered when establishing the amount of liquidated damages. Liquidated damages for non-completion of the work on time should be required for all public contracts.

A "pitfall" in public work is the inclusion of cash

allowances in the specifications, such as is frequently done in private work. This should never be done, for the reason that it turns over to the architect a definite sum of the public's money to spend without competition, and while this procedure may be consistent with the best interests of the building, it is not good public policy, and I seriously question if it is legal. The architect should reserve the right to approve the sub-contractor under all conditions, for it is through the "good will" of the sub-contractors and the materialmen that little difficulties are ironed out during construction.

"Or Equal." This is not the place to debate "or equal." The principle of open and free bidding in public work forces the use of "or equal" throughout school specifications. It is of the utmost importance that the architect be the judge of "or equal." A forcible paragraph should be included in the General Conditions to the effect that the exact brand specified must be used, and where substitutions are desired they must be submitted to the architect for approval, which approval must be given in writing through the general contractor. This provision keeps the control and selection of material under the architect's control, where they rightly belong. It also, if rigidly enforced, discourages the use of substitutions, as the sub-contractor is required to have the general contractor make the requests, and this operates as a restraint in many cases. Another method of handling the question of "or equal" is to require the exact brand of material specified with the provision that all substitutions must be submitted before the receipt of the bids, and that where a substitution is granted, the substitution will be included in a bulletin sent to all bidders upon the work, after the receipt of the bids no substitution being allowed. This requirement, which is in line with legal opinion, is, however, pretty rigid, and it is questionable whether it is in harmony with the best interests of the public. Another method of handling the question is to require all bidders to submit with their estimates the substitutions that they desire to make with the prices, more or less, which in effect really makes these alternative estimates. A statement is generally included to the effect that after the award of the contract no substitutions will be considered other than those decided from the list furnished with the bid.

The method of procedure in constructing the building should be given attention, particularly if the building is an addition. In these cases it is usual to require that no workmen be allowed in the existing building while the school is in session, and that the school shall be kept in operation uninterruptedly at all times. It also is general to require dust-proof and noise-proof partitions to be constructed where alterations are being performed in the present building, and to require that the contractor work out a schedule of procedure with the architect and school authorities.

General Contractor's Work. A section should be included in all school specifications covering the

amount of work which must be done by the general contractor. It is important for sub-contractors and materialmen to have decided for themselves in advance questions as to who will furnish the water, heat, light, watchmen, hoists, scaffolding and toilet facilities, during construction. They are also interested in knowing whether these will be furnished free or whether the general contractor will charge them a pro-rata fee for their use. The general contractor should provide any temporary dust-proof partitions required in an existing building where alterations are being made. In addition to the services named already, he should also provide temporary fences, cutting off the area under construction from the other school property.

Sub-Contractors. Within the past decade a most unusual development has taken place within the building trades. This consists of the splitting up of the basic trades and the changing of their status from that of employes to sub-contractors. This movement is in line with the present age of specialization and standardization, and is in harmony with our present social structure. The architect and the contractor have not been alert and are slow in planning to meet this change. A decade ago an owner selected an architect who gathered around himself general contractors who were thoroughly familiar with the class of work desired by the architect. Specifications as we now know them were unheard of and unnecessary, due to the fact that the general contractor employed the mason, carpenter, painter, etc., on his own pay roll, and selected and trained them to do but one class of work, irrespective of what the specifications required. Now that the trades have organized into sub-contractors and that these sub-contractors have associations, we find them demanding definite and specific specifications on the work they are to furnish, so that they will feel sure their competitors will be required to furnish the exact article on which they estimated. This is particularly true of public work. It is no longer a question as to whether a certain material is good enough, but whether it is of the exact grade specified, in order to keep up the morale of the sub-contractors estimating upon the work. They soon find out whether their competitor is taking an "oat out of the bag" by furnishing one grade lower. If they find that this condition obtains, one may be sure they will go one step further than their competitors. It is for this reason that specifications in our modern methods of building should be very explicit and very complete.

Special Problems in Construction and Materials. A school building will not be sold, rented or leased, in the natural course of events, but must be kept and maintained by the owner until it becomes obsolete and is demolished. If the building be physically defective, requiring constant maintenance, it will not reflect credit upon the architect. Another point to consider is that the school will be in care of a janitor, who may be a political appointee who will give the

building the most elementary maintenance, if any. The materials entering into a school building must not only be "fool-proof" but "abuse-proof." This creates several problems which are peculiar to school buildings: first,—the building will receive practically no careful maintenance service; second,—it will receive the hardest kind of wear and tear from minors at an age when destructiveness is most prevalent; third,—the building will never be sold, but must be carried by the owner. If there is any class of work where good, sound building construction should be practiced, it is in a school building. These suggestions should be given special attention.

Systems of Waterproofing and Dampproofing. Water is most difficult to contend with, and the toughest enemy to conquer. It causes trouble in three major portions of a building: 1. Foundations and Basement. 2. Exterior Walls. 3. Roofs.

There are three basic systems of waterproofing the foundations which I have used to some extent,—waterproofed concrete, membrane system and the pulverized iron system.

Integral System. A successful integral waterproofing system usually results from the use of a combination of labor and compound in the proportion of 90 per cent labor and 10 per cent compound. The "human element" enters into this class of work to a great extent, and when "good will" is absent the problem is greatly complicated. The architect sometimes takes the claims of the manufacturer on their face values, incorporates them in his specifications and asks the contractor to guarantee them. The manufacturer of the compound may claim that the reason one did not get the result he promised is because the contractor did not "follow the printed instructions." The contractor does not see why he should be required to guarantee the results claimed for a secret compound. My theory is that the manufacturer who developed the product knows what it is and will do, and is the one who should assume the responsibility for the success of integral waterproofing. To put this theory to practical application, the specifications require the manufacturer to furnish the material and supervise the installation of all concrete and mortar where his material is called for to produce a waterproof result. For this supervision he usually charges the general contractor about \$20 per day, plus expenses. As the value of integral waterproofing depends on the kind of concrete produced, one is assured in this way that excellent concrete will result and no excess water will be used, which result is worth the supervision fee charged. In such a case the manufacturer guarantees and furnishes the owner a maintenance bond, co-executed by himself and an approved surety company, that the work will be water-tight.

Membrane System. When the problem of waterproofing is very serious, I generally turn (rightly or wrongly) to the use of a membrane system of waterproofing consisting of alternate layers of hot asphalt and cotton saturated with asphalt, though other sat-

isfactory systems of membrane waterproofing use rag felt, asbestos felt and burlap for the reinforcing agent, and asphalt or pitch of various consistencies and grades for the waterproofing element. The best of waterproofing can be analyzed as 25 per cent materials and 75 per cent labor. A good waterproofer can produce better work with poor materials than a poor waterproofer can with the best of materials. My belief is that the best assurance for successful membrane waterproofing is the requirement that it shall be done by a specializing waterproofing contractor. Another requirement to assure success is to specify the materials of a high grade company which will follow through and look after the work in a general way so as to make it successful. Membrane waterproofing should be guaranteed directly to the owner by the waterproofer, which guarantee should be backed by a maintenance bond for about five years and co-executed by the waterproofer.

Pulverized Iron Systems of Waterproofing. This system is sometimes used when it is questionable whether a waterproofing system is necessary or not, because it is the only system which I will use that can be logically applied to the interior of the foundation walls. For this reason, when in doubt, a separate price is requested on work of this type with the reservation that the right to accept the bid will run for the life of the contract. This will allow the saving of the cost of the waterproofing in the event that it should develop that no waterproofing is required. I have found this an excellent method when in doubt, and have frequently saved the entire cost of the waterproofing.

The method of waterproofing by this system is generally this: Finely ground pulverized pure iron combined with chemicals is mixed with water and brushed into the pores of the masonry, applications being made until the desired oxidation results, after which a heavy slush coat of the compound, sand and cement is applied, and finally a neat cement wash is brushed over the waterproofing. The pulverized iron is oxidized by means of a chemical corroding agent and water. The result is a plating of corroded iron over the walls and bottom, of sufficient strength to withstand any hydrostatic pressure the structure is capable of withstanding. One of the dangers of this system is that the waterproofer must estimate the amount of application that may be necessary to withstand the most severe conditions, which generally occur during the spring thaws. The advantage of this system is that this work is being done at the present time by experienced waterproofers. This work should be guaranteed and bonded as suggested for the membrane system.

Dampproofing Exterior Walls. Here is a quotation from circular of The Bureau of Standards No. 151, being the report of The Bureau of Standards Plastering Conference: "There are certain localities in the United States where the climate is uniformly hot and dry. (In the preceding sentence particular emphasis is to be placed on the word *and*.) With the

exception of in such localities, it is recommended that all exterior masonry walls be furred." This quotation is preceded by an authoritative and complete analysis of all the conditions of the problem, which warrants the conclusion reached. Poor workmanship and materials are responsible for most of the troubles encountered with water soaking through exterior walls. The present styles of architectural design have a bearing on the question, due to the lack of sill courses, water tables and cornice protection. Dampproofed exterior walls can be obtained if these precautions are taken:—Always fur plastered exterior walls. Never use thin back-up tile, clay or concrete. In severe cases parge the back of the exterior wall with waterproofed cement mortar before furring.

In connection with furred walls, the cheaper building can be furred with 1 x 2-inch spruce spaced 12 inches on centers and covered with metal lath and plaster. Wood furring should not be used for the better class of buildings or for buildings at the seashore where considerable dampness occurs. In these cases the inside of the exterior walls should be coated with an asphalt compound and then furred with split furring tile; the asphalt should continue out on the floors, ceilings and walls for a distance of about 3 feet. When the conditions are severe, such as at the seashore, it is desirable to parge the inside of the wall with a coat of 1:2 waterproofed cement mortar before the asphalt compound and furring are applied. The parging should continue out on the rough concrete floor slab and around the windows and out on the ceiling a distance of about 3 feet. Due to the fact that all face bricks are or should be laid up from outside scaffolds, and that face bricks are selected and laid for architectural effect, it is impractical to thoroughly slush the bed or cross joints of face brick. The mortar is deposited around the edges of the brick with the point of a trowel and the brick bedded, the mortar extending back from the face of brick about 1½ inches. When tile backing is used it is practically impossible to thoroughly slush and fill the joint between the face brick and the back-up tile, with the result that the water enters through the brick joints and soon filters and percolates through the joints of back-up tile, and in some cases builds up a pressure so as to force itself through the asphalt coating, window sills, floor slab, etc.

Roofs. Considering the lack of maintenance it generally receives, a good roof is of the utmost importance. For flat roof surfaces of large areas, the choice falls between a pitch slag and felt, or an asphalt and felt roof. Both types give excellent service if care is used in the selection of material and of the sub-contractor using it. On school roofs there are usually ventilators, skylights and scuttles. The composition is laid immediately after the roof slab has been cast. There results a considerable amount of traffic over the roof before the workmen are through. This damages the roof to a considerable extent and in a way that it is difficult to estimate.

An improvement over the ordinary method of laying composition roofs is to apply the first three plies and then have the mechanics leave the work. When the parapet walls are completed, copings set, ventilators applied and all of the other work on the roof is completed, the roofer returns and repairs the damage to the base coats, and applies the final plies of the composition roofing. All flashings for a school roof should be of the most durable materials obtainable. The parapet walls should be flashed their full height. The best method of flashing a parapet wall is to use a lead cap flashing, as it seats well on a masonry wall. This cap flashing should be installed under the coping to form a drip on the outside, and should be continued through the wall and down the inside approximately 6 inches, with a 1½-inch lap. The base flashings should be of copper and locked to the lead cap flashing. An examination of parapet walls in a considerable number of schools discloses the necessity of thoroughly flashing the entire back of the parapet wall and indicates that all parapet walls should be 12 inches thick.

Stair Halls. Stair halls receive a tremendous amount of traffic and abuse. The reason is that the classes are constantly changing. This traffic is of the most destructive nature, and the materials should be selected to withstand it. The stairs are often of steel, strong enough to support a live load of 150 pounds a square foot. A balustrade is often provided about 5 feet high to prevent the pupils from pushing one another over the rail. Among the best stair treads are slate, soapstone, bluestone, terrazzo or cast iron with an abrasive element non-slip tile etc. Bluestone, which is extremely hard, comes about 2 inches thick, and wears non-slip. The platforms should be of the same materials as the treads. The walls of the stair halls should be wainscoted to a height of 5 feet or more with a material that will stand abuse and pencil marks. The best materials for this purpose seem to be glazed brick or salt glazed brick. The walls above the wainscot are generally plastered. A light colored impervious brick may be used above the glazed brick wainscot.

Corridors. School corridors receive the same traffic as the stair halls and should have materials to withstand the resulting wear. As noise is a disturbing element in the corridors, every effort should be made to minimize it. The materials most used for floors to accomplish this are either cork tile, linoleum tile, linoleum, rubber tile or mastic floors. Much might be said about each. Considering price, appearance, durability and value received, I consider plain brown battleship linoleum the best material for school corridors, providing it is properly laid and maintained. Terrazzo has been used with considerable success for corridor floors, but it is not very quiet. Terrazzo should be made non-slip by the addition of an aggregate which is sprinkled over the surface, displacing about 40 per cent of the marble chips. Mastic tile, cork tile and rubber tile have been used with varied degrees of success. Rubber

tile, linoleum and linoleum tile are secured to the floor with the same kind of cement. Moisture attacks the cement used in laying these floors. For this reason these materials should not be used where the floor foundations are on earth, despite the fact that the basement may be waterproof. In these cases terrazzo or mastic floors have proved successful. The walls in corridors should withstand abuse, and the materials selected are generally those used for the stair halls. In cases where the appearance of a brick wall is objected to, a colored ornamental architectural terra cotta cap may be used above the brick wainscot to produce a pleasing effect.

Classrooms. Wood is often considered the best material for classroom floors, considering ease, underfoot quiet and ability to secure desks. The choice seems to lie between yellow pine and maple. Yellow pine should at least be specified as dense heart rift "B and better" grade. No inferior grade should be used, for the reason that the mopping of a yellow pine floor wears at the sap streaks and causes the floor to splinter at the edges. This is particularly true for sap rift flooring. The advantage of pine flooring is that it can be solidly nailed, lays perfectly straight and true, does not warp or twist to any appreciable extent, and comes in long lengths. Maple flooring should be graded as No. 1, formerly known as "clear" grade. This flooring comes in standard lengths of even feet, and when it is used the sleepers should be spaced not more than 12 inches on centers so that a bearing can be had on at least two surfaces. It is always preferable, where funds permit, to use under-flooring where maple floors are used. The wood floors should be finished with a sanding machine run diagonally across the floor to prevent cupping, and to assure perfectly level surfaces. The floors should then be treated with an oil or a floor preparation which holds paraffin in suspension. Walls and ceilings of the classrooms should be plastered. The lower portion of the classroom walls to the height of the chalk rail is often covered with a heavy woven canvas to prevent the children from damaging the plastered wall. Wood makes the best classroom trim. Oak, chestnut and yellow pine have been used with considerable success. The pupils' desks and seats are wood, teachers' desks and chairs are wood, cabinets as a rule are wood, and it is always well to recall the wood treatment in the blackboard trim, door and window trim. There are many composition blackboards, some of which seem to have merit. Natural slate is an old standby and has been used with much success, and is usually my preference, although there are some cases where water turns the slate to a gray color very quickly. Cork bulletin boards are generally installed in connection with blackboards, and in a good many cases a cork strip is placed over blackboards so that standard size illustration sheets can be installed for exhibition or decorative purposes.

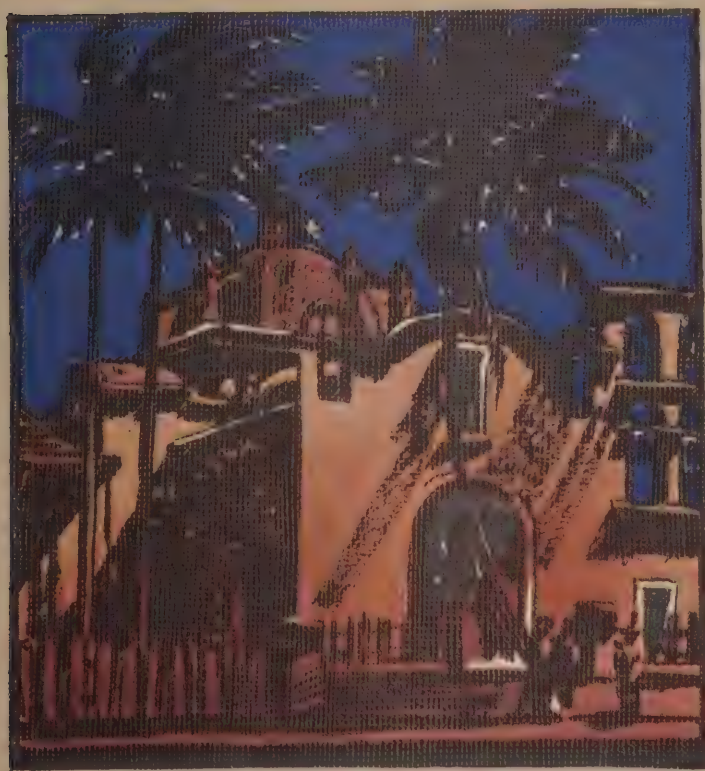
Classroom windows can be made in a variety of

types and sizes, but preference seems to be for double-hung wood windows and certain patented windows. Windows should be shaded at the center with the shades drawing up and down so that light can be had at the far side of the classroom, which would not occur if the shades were pulled from the top down in all cases.

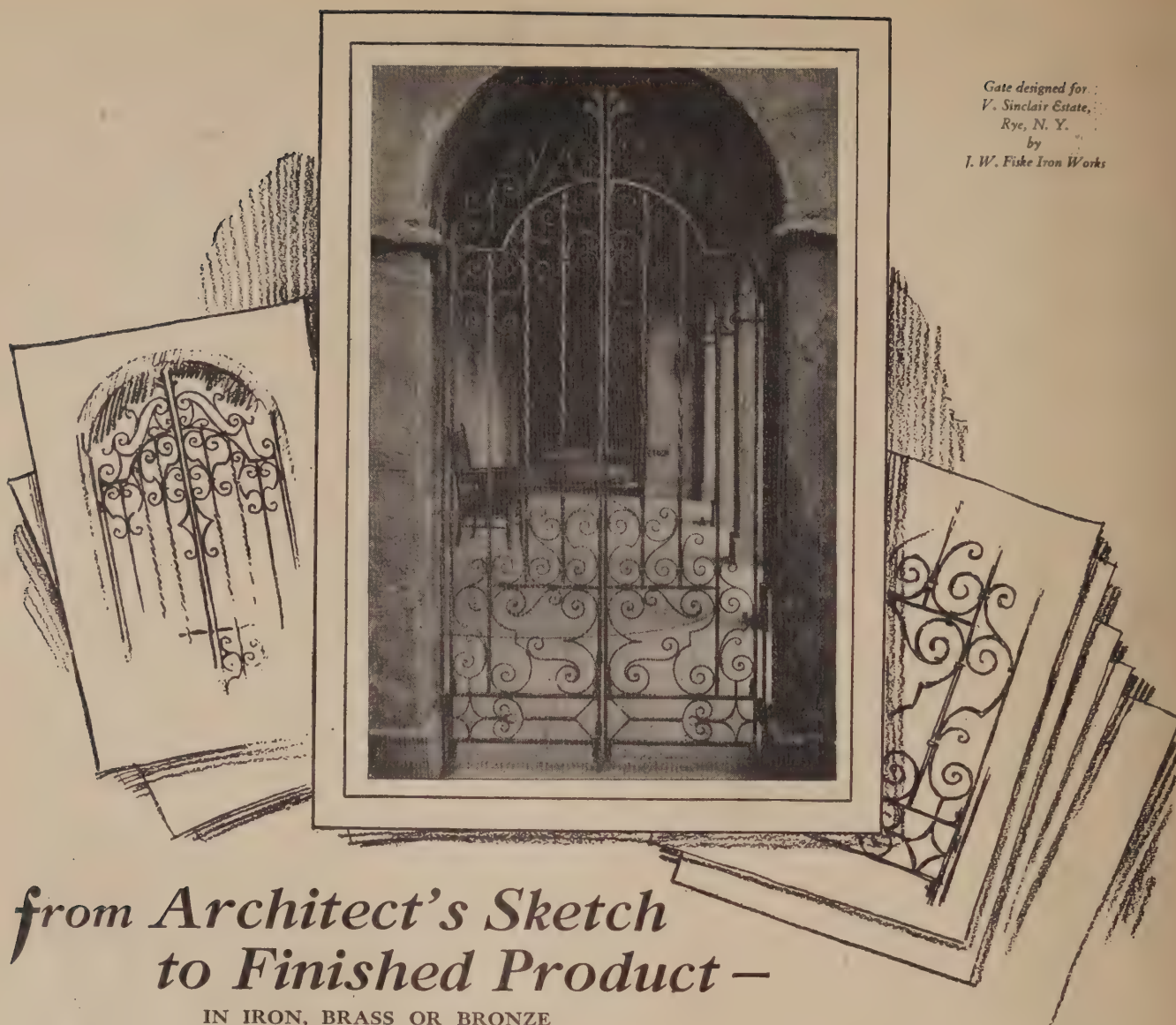
Toilets. Floors in toilet rooms are generally of either tile or terrazzo. Terrazzo is the cheaper of the two, but is not as sanitary as ceramic tile. The wainscots are usually either tile-glazed brick, glass or Keene cement. Tile is the material most widely used, although structural glass in ashlar form is growing in popularity due to the new methods of, economy in the production of structural glass. Toilet partitions are generally wood, slate, soapstone, metal or marble. Wood should not be used, except where economy is of the utmost importance, as it is practically impossible to keep the doors in place. The pupils swing on them and soon tear them off the butts. Slate and soapstone, while very sanitary, do not make a very desirable impression, due to the fact that they are oiled during the vacation period and become black and greasy in color. The doors of the compartments are often of wood, and it is so difficult to keep the doors on these partitions that some school boards omit the doors entirely. Marble, while desirable, is rarely used owing to its cost, although in normal school buildings of the better class its use is legitimate. The most practical partition in my opinion seems to be the standard steel partition with metal doors, such as is used in the better class of factory buildings. These partitions stand abuse, and it is rare to find a door off the hinges.

Gymnasiums. Gymnasiums should have double floors. The finished floor should be $1\frac{1}{8}$ inches clear grade maple with all lengths under 4 feet culled out and not used. The double floor allows for the insertion of the flush sockets which are required for gymnasium apparatus. The walls of the gymnasium should usually be buff brick, with a salt glazed brick wainscot about 8 feet high and laid with tight joints. Windows consisting of large banks of pivoted sash operated by sash-operating devices, with the interior protected by a wire guard, flush with the brick wall, make an ideal arrangement. A base of $\frac{3}{8}$ -inch steel plate about 6 inches high is generally installed around the walls and grouted solidly with Portland cement. This base prevents the gouging out of the brickwork by forcibly shoving the horses, parallel bars and other apparatus against the wall. The ceiling should be of Keene cement and the lighting fixtures should be recessed flush. Where clocks and bells are required, a recess should be provided for them, and they should be flush with the wall and covered with a wire guard. Pipe hangers with clamps should be installed in the ceiling, so that pipe beams can be installed by the gymnasium equipment contractor. If these pipe hangers are of more than 1 foot in length, they should be braced against side swaying.

THE
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IN TWO PARTS



PART ONE
ARCHITECTURAL DESIGN
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Published Monthly by

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Paul W. Hayes, Vice-Pres.; Robert Sweet, Sec. and Treas.

Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, \$7.00. Canada, \$8.00. Foreign Countries in the Postal Union, \$9.00

Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat
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BOOK DEPARTMENT

A NEW EDITION OF A WORK ON GREEK ARCHITECTURE

THIS work, which was first published in 1902, is based upon a course of lectures by William J. Anderson before the School of Art, of Glasgow. Mr. Anderson intended to publish this course of lectures, but he died before his aim was accomplished, and the material was placed in the hands of R. Phene Spiers, who produced the original edition of the work. The present edition, to all intent and purpose, is new. It has been entirely rewritten and revised by Mr. Dinsmore, and it is related to the previous editions chiefly by the fact that it has retained to as great an extent as was possible the arrangement and language of the edition of 1907. The great merit of this scholarly history consists in its embodying the latest results of excavations and research, since to keep abreast of the vast amount of research accomplished by various nationalities one must be in touch with the latest publications upon archæology. For some years we have learned of new excavations of Grecian architecture. We gather an idea of their importance in direct ratio to the amount of publicity they receive. This publicity, however, is no index to their

importance; it may have been caused by any number of reasons. We cannot properly correlate or place in order of their importance these new discoveries in research without accurate knowledge and considerable study. This, however, has been done for us by Mr. Dinsmore in this publication. Here is a work intended primarily for students of architecture. The story, necessarily a mass of details, is simply and concisely told. Furthermore it is told in an interesting manner. The subject might easily become monotonous, but Mr. Dinsmore has avoided such a pitfall, and it holds the reader's interest until the end. True, at times, since all such histories involve long descriptions, the mind is likely to wander, but this is only momentarily. For others it is an excellent review, not only in refreshing one's knowledge but in placing before the reader additional information of exceptionally wide value concerning this important period.

As the introduction says, "our business is to present the lessons of architectural history in a new light, to give the architectural student a clear apprehension of the historic significance of the style." The subject is treated

The Smaller Houses *and* Gardens of Versailles

By Leigh French, Jr. and Harold D. Eberlein

FOR the moderate-sized American suburban or country house there is nothing to follow in the way of a type at once more beautiful and more practical than the seventeenth and eighteenth century French houses of the same kind. The type possesses that graceful balance in the way of exterior design and that slight degree of formality of interior which is being expressed in current domestic work of the same character; and from all the domestic buildings of seventeenth and eighteenth century France there is nothing which offers a more fruitful basis for study than the smaller villas built near Versailles for the attendants of the French court. These buildings possess in an unusual degree just those qualities in the matter of design now most sought for in America.



THIS volume, prepared by two students of French and American architecture, is a practical study into the adaptation of the simpler French forms to American conditions. There is not one of the many villas illustrated which does not afford abundant suggestion in the way of exteriors to present-day architects, and the interiors with their simple and graceful disposition of wall paneling, mantels, and stairways abound with suggestions for working out interiors to accord with the expression given by the buildings' exteriors. Plans in many instances are easily adapted for use today, and the arrangements of the gardens and other outdoor areas offer suggestions for making these important adjuncts to American suburban or country houses heighten the character and interest of the buildings themselves.

202 Pages, 9 $\frac{3}{4}$ x 11 $\frac{3}{4}$ Inches. Price \$6

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Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency anywhere in America even a few years ago.



Kensington Schoolhouse, Great Neck, N. Y.
Wesley Sherwood Bessell, *Architect*

THIS volume, a companion to another published in 1914, records the results of endless study and experiment in different parts of the country, summed up and presented. By illustrations of exteriors and interiors, by floor plans and carefully written descriptions and articles by well known architects and educators, the present high standard of schoolhouse design is made plain, and these results which have been achieved by a few architects and school boards are thus made possible to all architects who are interested in schoolhouse design. The compiler has selected from almost 1000 exteriors and floor plans the school buildings to be illustrated, and the volume records "a process of innovation and elimination, namely, the introduction from time to time of features which have been deemed desirable and practical, and the elimination of things which, owing to changed school methods, are no longer required."

400 pages; 7¾ x 10½ inches
Profusely Illustrated; Price \$10

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in a historical rather than an analytical manner; a chronological treatment has been adopted dividing the field into successive epochs, examining the general characteristics of the civilization of each period and the ways in which these characteristics gradually modified the ideals and forms of architectural expression, "unlike Bowmann, Choisy, Durm, Marguad, Stevens and Beiror, who treated the subject in an analytical manner."

The text is divided into several parts. First, the archaic period, the beginning of Greek political power and art. Second, the culmination or central period of from 460 to 400 B. C. Third, the decline. Then there are the beginning of the culminative period and the aftermath of the decline, to 300 A. D. The first chapter, in view of the remarkable discoveries concerning the archaic period made in the past 25 years, throws much new light upon the origin of Greek building. "It enables us to fill in the hazy background of the primitive period of Greek architecture." In the beginning of the present century Sir Arthur Evans threw new light upon the primitive period by his researches on the island of Crete and his discovery of the remains of a palace at Cnossus of the sixteenth century B. C. Of extraordinary interest in this palace is the preservation of the great staircase. The discovery of this staircase, as Sir Arthur remarks, "is probably unparalleled in the history of excavation, flights of stairs one above another being unknown even in Pompeii." Its existence had been entirely unknown.

The publication has a wealth of splendid illustrations from photographs and drawings, also an excellent collection of carefully studied restorations from most varied sources. It is regrettable, however, in such an important work, that many of the illustrations are too small for study; in fact, they sometimes defy even the magnifying glass. The book brings it out, contrary to previous belief, that the Doric and Ionic orders were developed simultaneously; that one did not replace the other, but that use of both flourished side by side. The earliest discoveries, from the time of Stuart and Revett in the middle of the eighteenth century to about 50 years ago, confined research to isolated temples irrespective of their surroundings. The most important temples were invariably surrounded by walls forming sacred enclosures in which shrines, treasuries and other subsidiary buildings existed. It is due to the great change made in methods of research during the past 50 years that these accessory buildings and enclosures have been discovered. "In fact the discoveries of the treasuries alone may be said to have added a new chapter to the history of architecture."

We are inclined to lose track of the fact that the Greeks frequently used the circular plan,—that they developed beautiful circular buildings, such as the rotunda at Epidaurus, the tholos at Delphi and the Philippeum at Olympia and the famous choragic monument of Lysicrates,—also that they were conversant with and utilized the arch and vault. Many such interesting facts are brought out by Mr. Dinsmore in this excellent volume. Study of Greek architecture is of course one of the fundamentals of architectural study, and the issuing of this work is important, particularly since it records results of the most recent research by students of several nations.

THE ARCHITECTURE OF ANCIENT GREECE. By William J. Anderson and R. Phene Spiers, and William Bell Dinsmore. 200 pp., 5x7 ins. Price \$7.50. Charles Scribner's Sons, New York.



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PERHAPS no architect who ever lived in America built up more of a personal following than Bertram G. Goodhue. His was one of the two or three names which came instantly to mind when Gothic ecclesiastical architecture was mentioned, and his churches, many and prominent, have exerted their influence upon ecclesiastical architecture all over the world. But Mr. Goodhue was equally talented in other and quite different ways. He well knew how to handle architecture of entirely other kinds, and his drawings, book plates, illustrations and type faces were of such note that they all but compete with his work as an architect of Gothic churches.



THIS volume constitutes a record or review of Mr. Goodhue's achievements in many fields. Those who collaborated or worked with him have contributed to its text, and its illustrations set forth the excellence of his work in all the arts of which he was an acknowledged master. It is a magnificent and authoritative work, issued by the Press of the American Institute of Architects.

Text and 273 Plates, 11 x 14 inches

Price, \$30

ROGERS & MANSON COMPANY
383 MADISON AVENUE NEW YORK

THE ORDERS OF ARCHITECTURE. By Frank Halstead. 139 pp., 7¾ x 11 ins. \$3 Net. John Wiley & Sons, Inc., New York.

SO many are the innovations which during the past decade have been made in building, and so numerous are the details which must be mastered by students of architecture and architectural drafting, that it might well seem that students are in danger of slighting, in favor of something apparently of more immediate and practical importance, the very things which from time immemorial have formed the very foundation stones of architecture. Study of the "orders" is by no means a hit-or-miss proposition. In design and proportion, to their most minute detail, they are the result of study and practice which has extended through countless centuries; and as we study the buildings or the ruins of antiquity it is easily to be seen that all great architects,—those whose names are written in gold in architectural history,—are just those whose work shows ample knowledge of all the small details, the fine points of design and proportion, the accurate and discriminating use of which makes architecture one thing and building quite another.

In this volume, one of a recently published series of three, Mr. Halstead, who is an architect as well as a teacher of architectural drawing, deals with the "orders": The countless small illustrations which make up some 44 plates are from drawings which have been carefully made, many of them studied from the ruins of classical antiquity. Too much could hardly be said in praise of the thoughtfully prepared text, and one finds with satisfaction a complete glossary of the terms used by architects, ancient and modern in connection with the orders.

ENGLISH GOTHIC CHURCHES; The Story of Their Architecture. By Charles W. Budden. 145 pp., 5 x 7¼ ins. Price \$2.75. Charles Scribner's Sons, New York.

STUDENTS of architecture find in England a rich opportunity of studying buildings early, middle and late, and often in the same locality there exist structures which represent with few if any gaps all the different types which have followed one another from Tudor days to the Victorian period. With ecclesiastical architecture, in fact, the opportunity for study is even more broadly extended, since there are still in England churches dating from Norman times. An English church, when once built, was likely to endure for ages, often added to and remodeled, to be sure, but their very remodelings and alterations add to their value and interest to architectural students as illustrating the long succession of types and showing the facility with which one type could be used along with another. Some old churches, such as Canterbury Cathedral, show use of almost all the types, from early to late, in which this development may be studied.

In this volume Mr. Budden presents a study into certain phases of English Gothic as applied to ecclesiastical buildings, and more particularly to parish churches. He dwells upon the characteristics of various parts of a church,—its walls, tower or spire, its porch, entrance doorways, windows, arcades, vaulting and floors, the text made more interesting by the inclusion of countless well chosen illustrations and a sort of "itinerary," which gives by shires or counties the locations of the most interesting examples of English Gothic architecture. The work would be invaluable to a traveler, particularly if he be architecturally inclined and given to exploring.



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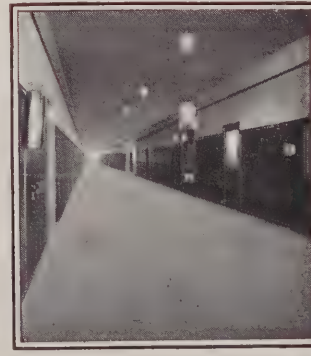
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MODERNE ARCHITECTUUR. By J. G. Wattjes, Uitgevers-Maatschappij "Kosmos," Amsterdam.

MANY are the useful and excellent volumes now appearing dealing with architecture of different types which has been left by the ancient to the modern world,—the chateaux or small wayside churches of France, the village churches of England, or the Romanesque remains in Spain or the south of France,—or else dealing with the modern "small house," just now popular everywhere. Now there comes from Holland a volume devoted not to the architecture of ages past but to that of the present, and of various types,—individual residences and large structures containing apartments; churches; office buildings; manufacturing structures, etc., and not work of one country alone but that lately done in Holland, Norway, Sweden, Belgium, England, and elsewhere, with one section devoted to the achievements of certain well known architects in the United States.

American architects are frequently accused of radicalism, perhaps because architects in America invented the use of steel construction, which has made possible the skyscraper. Even so, our radicalism seems to be confined to the sphere of structure, since everywhere in America architects have learned or are rapidly learning to adapt to the requirements of the skyscraper the most conservative forms of design; little of startling radicalism in design is to be seen in the Shelton Hotel, New York, or in the towering but nevertheless graceful structures which are being built throughout the country. On the other hand, the radicalism of the architects of north-

ern Europe, whose work is here illustrated, seems to be confined to design,—radicalism in design pushed to its extreme; not that all these illustrations are of buildings in the extreme modern style, for some there are which indicate possession of a strong hold upon architectural tradition and successful efforts made to adapt well tried architectural forms to uses which are wholly new.

On the whole, one examines this interesting volume with a feeling of gratitude that America's representation is as good as it is. The section devoted to America's achievements compares favorably in the matter of design with the sections devoted to other countries,—and one notes with satisfaction that the few illustrations of radical design are of structures that were never built!

THE PAGEANT OF AMERICA. Volume 4, *The March of Commerce*, by Malcolm Keir. 361 pp., 7½ x 10 ins. Price \$5. Volume 6, *The Winning of Freedom*, by William Wood and Ralph Henry Gabriel. 366 pp., 7½ x 10 ins. Price \$5. Yale University Press, New Haven.

HISTORICAL research, which is likely to precede the actual recording of history, has during the last few years produced quite a number of notable volumes. One such work, a series of volumes which records the history of America and which lays considerable stress on the country's achievements, is this extensive series being issued by one of the departments of Yale. The titles of both the volumes noted here convey an excellent idea of their scope, their chief importance and interest to architects being their illustrations of old buildings of interest which have in many instances ceased to exist.

"CHURCH BUILDING"—By *Ralph Adams Cram* (A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.



THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added,

which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of churches and of their worship.

345 pages, 6 x 9 inches, Price \$7.50

ROGERS & MANSON COMPANY, 383 Madison Avenue, New York

THE EDITOR'S FORUM

A DETROIT COMPETITION

DESIRING to promote and stimulate interest in the artistic development of residential districts in Detroit and its vicinity, *The Detroit Free Press* has instituted a competition open to architects and architectural draftsmen for designs and plans of residences of types suited to local requirements. The designs must be suitable for level lots from 35 to 50 feet in width, the lots to be from 125 to 150 feet in depth and not on corners. Entrance to a one- or two-car garage is to be from the street. It is to be optional with the designer whether the garage be attached to the house or not, but the cubage of the garage is not to be included in the limit of cubage for the house. Material and design must conform to local requirements, and all drawings submitted are to become the property of *The Free Press*. Due credit will be given the designers of any drawings published. The jury of award, consisting of three members, will be selected from the active membership of the Detroit chapter of the American Institute of Architects, no member of which will have participated in the competition, nor any member having employees who have submitted drawings.

The Free Press will award five cash prizes of \$500 each for the five best designs of single dwellings, and one cash prize of \$500 for the best design of an income type or duplex, should one be found eligible by the jury. In the event that no solution of the income type or duplex shall be found, then six cash prizes will be awarded for single dwellings. In addition to the cash prizes there will be six honorable mentions. No preference will be shown by the jury for any specific cubage. The prize money will be considered part of the fee should working drawings be desired. A competitor may submit more than one set of drawings. Drawings must be delivered to *The Detroit Free Press* on or before noon, May 1, 1928. Awards to be made May 7.

GIFT FOR COOPER UNION

ANNOUNCEMENT was recently made of the presentation to Cooper Union, New York, by his widow of the large collection of water colors and architectural drawings of the late Arnold W. Brunner, the architectural department of the Union having been selected by Mrs. Brunner as, on the whole, the most fitting place in which to preserve for posterity records of the contribution to American development in the way of architecture and city planning for which Mr. Brunner was widely known. Plans of leading cities throughout the United States and drawings of nationally known buildings and

institutions are included in the exhibit to be housed in the old brownstone edifice which stands at the corner of Astor Place looking down the Bowery, the building in which Abraham Lincoln, in 1860, made an address that gave him the nomination.

TRAVEL COURSES FOR WOMEN STUDENTS

THERE are announced by the Cambridge School of Domestic Architecture and Landscape Architecture two summer travel courses for women students. One of these courses covers travel and study in Europe (England, France and Italy), the party being scheduled to sail from Boston on the "Laconia" on June 10, and to reach Montreal on the "Ascania" on September 22. The second tour covers Oxford and the district within about 40 miles, which includes Windsor, Winchester, Salisbury, Bath, Gloucester, Stratford-on-Avon, Cambridge, and part of the Cotswolds; scheduled for the period from July 9 to September 1. Communications concerning the summer school should be addressed to Henry Atherton Frost, Harvard Square, Cambridge, Mass.

HONORS FOR MR. CROCKER

WILLIAM H. CROCKER, editor of *The American Architect*, has recently been elected an honorary associate member of the New York Chapter of the American Institute of Architects. This honor was conferred "in recognition of distinguished services that have been rendered to the American Institute of Architects and the profession."

AN ANNUAL SUMMER SCHOOL

ANNOUNCEMENT is made of the organization of the 1928 session of a summer school for American students, a session such as have been conducted for several years by Professor Paul Valenti, of Washington University. As heretofore, the session will include travel as well as study, and as the school's headquarters there has been secured the Villa Plinius, at Bellagio, on Lake Como, the most beautiful of the Italian lakes, from which short trips to neighboring towns will be made by motor boat. These tours and classes, which are arranged with the needs of architectural students chiefly in mind, are conducted under the auspices of the Italian Government, and students given every facility for study and research. The itinerary begins on July 2, when the party will leave New York for Palermo on the "Columbo," and will end September 17, when the party will be due in New York on the return trip.

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From a Charcoal Sketch by Alan Devereux, A.R.I.B.A.

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER FOUR

APRIL 1928



ON THE PHILOSOPHY OF MODERN ART

BY

ALAN DEVEREUX, A. R. I. B. A.

WHAT is art? That is a question which many have asked and many have answered,—in as many different ways. It seems to me, however, that there can be only one definition of art in its broadest sense,—“creation through inspiration.” From this one postulates that a true work of art contains beauty,—though not necessarily the accepted standard of beauty. Perception and subsequent appreciation of beauty are essentially relative and consequently dependent on the varying human viewpoint. As an instance of this, we can now perceive beauty in the subtle moods of Japanese and Chinese art, primitive peasant art, and negro sculpture, where our forefathers could perceive none, or at best only a sort of meretricious “quaintness”; a further instance of this is the recent growth of appreciation of the art of the European primitives of the middle ages, and of the paintings of El Greco and William Blake. As a development of the definition already given, one may add that inspiration is the quality that creates from the inner appreciation of the beauty of things perceived, and, being thus conceived, gives birth to art. For beauty may be perceived everywhere and in many ways, proportionate to one’s powers of perception. A trained mind can perceive beauty obviously, where a clod will remain unmoved.

There has never been and there never will be any true significant beauty in the merely picturesque, which appeals only by means of the falsely sentimental values attributed to it by the untutored mind. True beauty is the sympathetic aid, essentially relative, æsthetic quality acknowledged by the intellect to be inherent in certain things of which we are conscious, so that it reacts on the imagination of the individual, suggesting in varying degrees the spiritual perfection of the unattainable. When some natural object or mental concept of anything at all is filtered through the artist’s power of inspiration, and is translated into stone or paint or sounds or words, it should acquire a subjective or spiritual quality,—or soul, if you like,—that causes the result to live as a true work of art. Stripped of its clothing this elusive, subjective quality is what modern artists of recent years have been looking for, and their researches have had some surprising and inter-

esting results. This modern art does not seem to care at all for appearances. The reason is, of course, that art has turned its boudoir into a laboratory, to many people’s deep disgust, and is now in its working clothes, testing, experimenting, exploring, seeking to regain that creative spirit that it has lost. It has discovered that it has something to say, and says it with no uncertain voice,—“creation, not imitation.” It has found out that a purely faithful imitation of anything in nature can never be art, however skillful that imitation may be; it can be only something second-hand, like a photograph or a player piano record. In speaking thus of the experimental tendencies of modern art, I am of course not referring to art in Australia, where I have been practicing architecture for the past five years. There is, practically speaking, no artistic research work of this nature going on there, excepting possibly in the work of John Moore, Norman Lindsay, Kenneth McQueen and one or two other lone explorers. The country is as yet too young, and too preoccupied with its material struggles to bother with metaphysical experiments in art, and Australian artists, brilliant as many undoubtedly are, are too cut off from the rest of the world, and too busy seeking a pathetically insecure livelihood to go much further than to cover the existing ground, and consequently cannot afford to ignore the inhibitions of popular taste.

But it is not of art in Australia that I write, but rather of this new modern art that has sprung up in Europe and America of recent years, which seems so puzzling to many people, and possibly I may help to straighten out a few misconceptions that may exist on the subject. In social contacts I find that it is the rule rather than the exception, even in the most cultured circles, when the subject of modern art is brought up, to dismiss it as being queer, distorted stuff, crazy cubism, or futuristic foolishness, apparently perpetrated by absinthe-soaked madmen during attacks of delirium tremens. It is, of course, just as easy to thus airily dismiss in a summary manner any other subject about which one happens to be in ignorance, such as higher mathematics as a lot of dry figures, or Einstein’s theory of relativity as a proof that straight lines are really crooked; but if

they really cared to look, they would find modernism all about them; they forget that the world still goes forward, ever seeking, ever finding new things and enlarging the scope of human consciousness, entirely irrespective of those who will not keep up with it, and who consequently are left behind.

Art, with a few exceptions, had fallen steadily back during the last three hundred years, until in the final part of the nineteenth century it had reached such a low ebb that it had practically ceased to be true art at all; but it is now again moving forward on the path of evolution, as all things must. The timely invention of photography eventually barred the way to any further depths of imitative naturalism in painting and sculpture. The setback to the progress of artistic evolution, due, perhaps chiefly to economic reasons and to the industrialization of the world which was rapidly changing human society, was, fortunately, only temporary. The world is by degrees getting used to the effects of the industrial system, and everywhere one notices a revival of interest in creative rather than imitative art. It is generally understood that there is far more spiritual freedom nowadays, compared with the cramping conservatism of the last century, and that this generation is far more concerned with the things of the spirit than were former generations. There is abundant evidence of this in the fact that art is once again moving forward, and in order to keep up with it one must understand what it is all about,—one must

learn the language. If art were to continue to appeal only to the simplest and least sophisticated minds of the community, it would never go forward, and the fact that it is going forward is sufficient evidence to show that already there is a large section of the public in other countries which has taken the trouble to carry artistic education a little further than the "twice times" table and words of one syllable.

Of course we all understand that there are certain individuals among the forward-moving group, as there are in every field of endeavor, whose work moves in a circle, and consequently never succeed in getting anywhere. If they do succeed in fooling the public, it is largely because their misplaced enthusiasm has caused them to fool themselves. But they seldom succeed in deceiving their fellow artists. Their efforts are similar to those of the Italian futurists some 14 years ago under the leadership of Marinetti, which although of significance in discovering a rather mathematical method for the portrayal of abstract qualities, such as motion and sound, did not succeed in achieving any relative success. Thus after giving birth to a few fresh and original ideas not altogether without a certain amount of influence on modern art, the movement was diverted into other channels and died a natural death. But to return to the close of the nineteenth century and the "twilight of the arts" which culminated in the invention of photography. By this discovery art was naturally diverted into the further



Illustrations from "Swedish Architecture of the Twentieth Century"

Loggia Overlooking Malar Lake, Town Hall, Stockholm
Ragnar Ostberg, Architect

Courtesy of Charles Scribner's Sons

cul-de-sac of impressionism, which may be defined as the recording of instantaneous impressions of color from the point of view of the human eye as a camera, involving what amounted to the scientific analysis of light, so that presently artists were ceasing to paint objects themselves, but their color impressions instead.

There were three great painters who appeared on the scene about this time. Cezanne, Gauguin and Van Gogh,—old masters now, who like most "old masters" were bitterly reviled in their time. These men saw their way out of this *cul-de-sac*, or at any rate saw clearly enough to be dissatisfied with it. Their dissatisfaction, however, as Sheldon Cheney puts it, was only part of the general dissatisfaction which the Victorian age was beginning to feel with itself. This feeling of unrest and dissatisfaction, which was so noticeable in the paintings of Cezanne and his post-impressionist followers, and which is so noticeable in the work of many of the younger artists of Europe and America today, was but a reflection in art of a change that was, and still is, coming over the world in its attitude toward life and the universe. Apart from its relation to art, materialism as a philosophy had begun to lose credit among thinking people, one of the reasons for this being, perhaps, the discovery that materialism would not completely explain the mystery of existence. Every period hitherto has found it necessary to hold certain postulations as being absolute and axiom-

atic. The last century accepted as absolute the facts of "laws" of nature,—that is to say, if one had facts, one therefore had the ultimate reality. Recent scientific research, however, into the constitution of the universe and of the human mind, has revealed that what we call facts, are, after all, only convenient explanations for dealing with the unexplainable in its relation to ourselves,—convenient pegs, in fact, on which to hang our philosophies. But although the pegs may seem real enough, we are beginning to realize that there is no solid wall to stick them into. Einstein has shown us that. Without any fixed datum point in the whole universe upon which to base our assumptions, we find that all our conceptions become purely relative rather than absolute. This Einstein theory of relativity may be considered as the culminating factor in the disillusion of nineteenth century materialism, and would seem, as far as a layman may judge, scientific thought to reduce all our axioms to the First Principle, or, as the Eastern mystics have it, "All is Brahma."

Art, therefore, has had to seek new forms and new outlets, and to do this it was necessary to discard many false ideas and misconceptions. It had to go back to fundamental principles, such as are found in the art of primitive times, when art was inspired entirely by the creative spirit, before it had been cramped and stifled by materialism, and when it still had the childlike naïvete of the savage,—such principles as are found in the abstract purity of the



Interior of Guild Hall, Town Hall, Stockholm
Ragnar Ostberg, Architect

Greeks, the form and humanity of the European primitives, and the mystic quality of Gothic art. Upon these foundations it was necessary to build with an entirely different end in view,—the creation of subjective truth rather than of objective truth. It was the realization of this that led Cezanne and the post-impressionists who followed after him to restore the third dimension as a quality of their design, while avoiding it as a means of portraying realistic illusion, and to make as their aim the solidity of form, not to the eye, but to the mind. This re-discovery of the third dimension in art resulted in the frequently misunderstood but extremely interesting and significant form of artistic research known as cubism, first conceived by a Franco-Spanish painter, Pablo Picasso. The fundamental idea of this cubism, I think, was that of disassociating the planes and also the perspective of an object seen, and of rearranging them in a picture in such a way that they will give a truer emotional or structural sense than appeared in reality. After all, as one sees an object from one side only, it is therefore an incomplete

viewpoint. A complete vision would show it not only from all sides and aspects, but also from within. Possibly some day there may be discovered a scientific equivalent for such a viewpoint. In painting, anyway, the idea seems to be to so reorganize the planes of an object as to express the painter's æsthetic emotion of it, rather than his visual impression of it. It is an interesting fact, in parenthesis, that Picasso and his followers are extremely sensitive and capable draftsmen and colorists from the more classic point of view. Some, indeed, were already famous, which goes to show that they have at least earned the right to experiment, and that there is method in their madness.

Cezanne, before he died, said: "I am the primitive of the way I have discovered." In turning to that aspect of modern thought known as "expressionism," we come to the full current of Cezanne's influence. This does not necessarily mean that expressionism was the "way" that Cezanne discovered, but it is certain that no other movement has since had so much influence on the art world as expressionism.

This movement seems to rise above the limitations of other more doctrinaire movements, such as cubism, futurism, vorticism, etc., while embracing all of them. It approaches art from an entirely different standpoint, and is only opposed to art that is merely imitational. It has invaded the field of literature and the drama. Expressionistic playwrights are already

widely known in Europe and America. Expressionistic architecture is now commonplace on the continent of Europe and in the larger cities of America. Expressionism is found even here in America in the graceful lines of a racing motor car or of an aeroplane or sailing yacht, in the hum of a dynamo, or the majesty of a locomotive, and in many other ways as yet unrecognized as such by the general public. Expressionism is, in fact, really a summary of all that is characteristic of the twentieth century, and is not merely a passing phase. The quality about it that is perhaps most indisputably modern is its intensity. Human consciousness has broadened, the rhythm of life has quickened, fast transport has reduced space and given us new sensations, lights are

brighter, and noises are louder than ever before. Art cannot remain as quiet as it has been in the past. It must not slip into being a mere refuge from life. Its value must be intensified. It must live up to the age.

And the new age is giving expression to the new art. Buildings are now being built higher than ever before, glorying in their height, reflecting power and intensity. Painting finds new values in purer color and purer form upon more subjective and abstract lines. Sculpture is being composed again in simple and more plastic form arrangements. Dramatists are beginning to forsake the old hokum and the old formulæ, and to pile up emotional climaxes, with little regard for naturalistic atmosphere, as in the works of O'Neill and Pirandello, who succeed in portraying life more directly almost than life itself can do. Directness and intensification have now become the order of the day, and it seems to me that only by use of some such process can art keep up with life. It can never be satisfied with an anæmic sentimentalism or mere prettiness,—and the proof is all around us, whether we like to recognize it or not.



Tower and Lake Front, Town Hall, Stockholm
Ragnar Ostberg, Architect

THE NEW YORK ACADEMY OF MEDICINE

BY
MATLACK PRICE
YORK & SAWYER, ARCHITECTS

IT is not at all in the realm of over-statement to say that in the new building for the New York Academy of Medicine these architects have not only added another distinguished piece of work to their already long list of achievements, but have also shown us that amid the exciting æsthetic experiments of the 1890's we too quickly skimmed over a particularly rich chapter in the picture book of architecture,—the chapter of Byzantine and Romanesque. There may even be some younger architects to whom Richardson's great Romanesque revival does not mean anything very real or definite, and

who suppose that if it had really amounted to much it would not have been so soon abandoned in the pursuit of more exciting architectural adventures. Montgomery Schuyler hailed Richardson's Romanesque revival as the logical solution of all the problems involved in modern building, and gave thoroughly sound reasons for his conclusion. And Richardson, who was not without followers or without admirable convictions of his own, backed by the best critical acceptance of his time, might indeed have more permanently influenced architectural style in this country if it had not been for the purely fortui-



New York Academy of Medicine
York & Sawyer, Architects



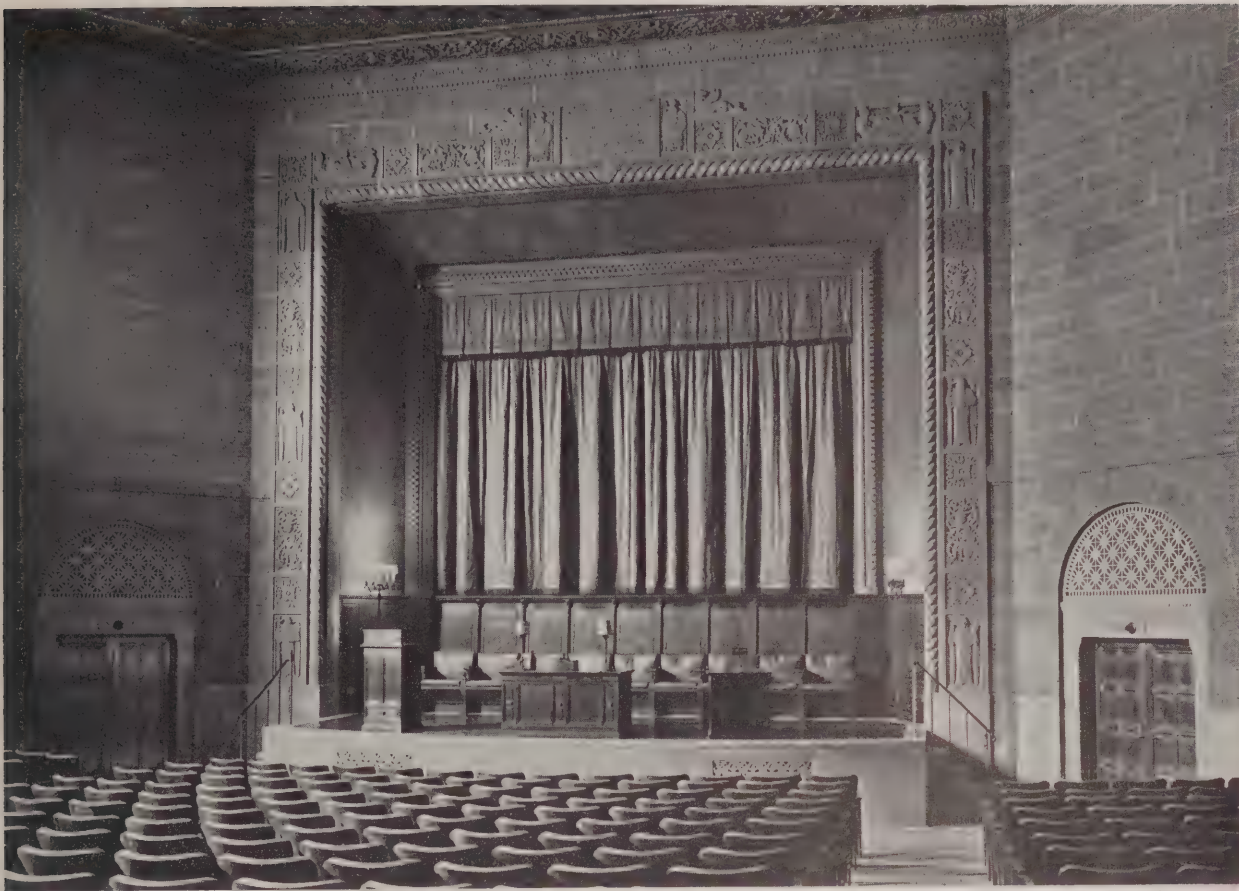
Doors in Main Entrance Hall

tous advent of the World's Columbian Exposition at Chicago and McKim, Mead & White's introduction there of an adapted Italian Renaissance. Certainly, after all that has happened in the half-century since Richardson's great adventure in Romanesque, it is intensely interesting to see the firm of York & Sawyer, themselves among the most able and brilliant offshoots of the old firm of McKim, Mead & White, turn back to that chapter of Byzantine and Romanesque and bring forth from it a version of these styles so new, so fresh, so vital as to seem almost the same stuff as the modernistic trend of today, the difference being that this new revival of Byzantine and Romanesque is far better than most of the modernistic work is, or is likely to be. This structure is among the most interesting of recent buildings.

The New York Academy of Medicine has shown, among other things, that the Bowery Savings Bank on 42d Street, by the same architects, was not at all an accidental or isolated success. The Academy of Medicine is of the same sort, and it is only reasonable to hope that these architects will go on with the development of this manner until its widespread influence is felt. The simple fact is, that it is good architecture. And it is good architecture because it satisfies not only the larger conditions of a building, but effects a nice relationship between wall surface and detail, and with detail which, in itself, is adaptable to a curiously modern manner of handling. The

exterior of the New York Academy of Medicine affords a good demonstration, as practical as it is æsthetic. There is plenty of latitude in the treatment of cornices (and the fashion nowadays is to minimize them); here also is used the infinitely adaptable *motif* of rows of small round arches, which may be scaled to frame windows or to serve as an enriched frieze; here too is used an adaptable method of window and door treatment, which may be as simple or as elaborate as the nature of the building requires. If a feature is needed, there is the balcony, which, as in the Fifth Avenue elevation of the Academy, may be supported on grotesque brackets, which like the corbels and capitals that abound in Byzantine and Romanesque may be as playfully grotesque as one likes and as may be appropriate.

As an important exterior detail, the design and execution of the incised lettering, both in the large inscription and in the window heads, must take its place among examples of the finest architectural lettering that has been done so far in this country. The various functions and purposes of the New York Academy of Medicine are succinctly outlined here by the director, Linsly R. Williams, M. D., so I shall comment only on the architectural aspect of certain of the interiors. These all have a quiet dignity befitting the building, and a manner thoroughly consistent with its whole character. The hall is broad and gracious, without being at all severe; there is



Stage and Proscenium Arch in the Auditorium

subdued color in the painted wooden ceiling, color in a fine large tapestry and incident in the door-heads.

To the right of the hall is the large "collation room," where meals may be served, and a smaller room in quiet green, also used at times for dinners. Between these two rooms (characteristically of York & Sawyer's always able planning) there is a very complete and very modern kitchen. To the left of the hall is the great auditorium, designed with exactly enough detail to be interesting and to escape bleakness, and with exactly enough plainness and simplicity to avoid distraction from the serious matters that are here discussed. The detail, of course, is again in this emancipated Byzantine-Romanesque

manner, applied with the restraint of true art; the lighting fixtures are admirable, and the rostrum and other stage furnishings are of great dignity. There is interesting design,—and excellent restraint,—in the walnut seats across the back of the stage, suggesting and yet not at all simulating choir stalls.

Architecture, and in this case the firm which designed this thoroughly modern building in such a blythe revival of a style that evolved in the sixth century, have served architecture's purpose extremely well in the planning and designing of a building which is not only practical and efficient, but of a dignified and gracious manner consistently expressed by the essential good taste of its skilled designers.

HISTORY AND PURPOSE OF NEW YORK ACADEMY OF MEDICINE

BY

LINSLEY R. WILLIAMS, M.D.

HUNDREDS of years ago physicians understood that they learned by experience, just as did the members of other professions, and appreciated that, as their services were for the relief of suffering and the prevention of disease, if their experiences were exchanged, the advancement of knowledge would take place more rapidly and thoroughly. This attitude of mind was expressed in New York over a hundred years ago by the organization of a number of societies. As time went on

a group of prominent physicians felt that at least one society should be permanent, and that this society should have as an accessory a library where all physicians could have access to the most recent contributions of medical science. Thus in 1847 a medical association was organized and four years later incorporated under the name of "The New York Academy of Medicine." The new Academy passed many years in search of a permanent home and finally purchased an old house at 12 West 31st



Window on Fifth Avenue Facade



Side Door on East 103rd Street

Street, and in 1889 moved into a new building at 17 West 43rd Street. Shortly after its opening there was an interesting note in one of the annual reports: "The opening of our new home and the development of its facilities, which are unsurpassed, have been attended, not alone with pleasure to its fellows and friends, but with that which this department has been compelled to recognize,—increase in expense."

Just as its facilities at 31st Street were outgrown, within 20 years its facilities at 43rd Street became inadequate on account of the rapid growth of the library and the limitations of stack space, to provide which was one of the primary purposes for which the Academy was founded. Who could have foreseen in the 80's that within 30 years the Academy would be adding 5,000 volumes a year to its library as well as many thousands of pamphlets? Appreciating the importance of books and the library, open to all medical men and to the public, the new building at Fifth Avenue and 103rd Street was conceived with the idea that stack space should be provided for an almost indefinite number of years. As the library is perhaps the most important part of the Academy, the plans provided for the new building a very large, beautiful and comfortable reading room; an additional reading room for journals; a quiet, comfortable and charming small library, reserved for the fellows or members of the Academy; and a book stack which would house 150,000 volumes and over 100,000 pamphlets,—enough space for at least the next 20 years. For future enlargement of the stack and building, the stack is so planned that it can be extended upward and laterally, so that space will finally be available to house nearly 1,000,000 books.

The Academy has functions other than that of maintaining a library, and supplies a most important meeting place for physicians from all parts of the city. The fellows of the Academy, who number nearly 2,000, are divided into 12 different sections of specialists on diseases of children, diseases of women, nose and throat, ear, etc., and these different sections hold monthly meetings at the Academy building. On the various floors of the six-story building are smaller rooms of differing sizes for committee meetings and offices of the different medical societies, as well as the offices of the Academy itself.

The Academy maintains a bureau of information on facilities for medical education for physicians not only in the city but for physicians who come from the rest of the United States and abroad. About 500 physicians from out of town visit this bureau annually, seeking advice in regard to post-graduate work and the various hospital clinics which are being held in this city. Further information is available for physicians who desire post-graduate courses in Europe or in the United States outside of New York.

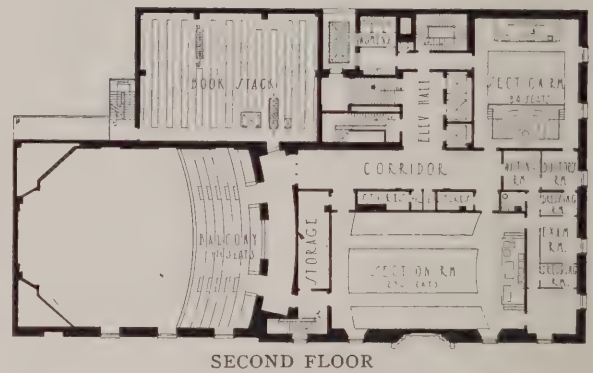
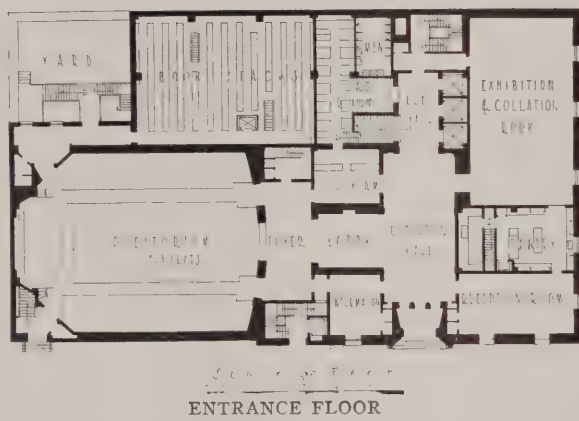
The New York Academy of Medicine is a limited-membership association and is governed by a council which consists of the ten elected trustees, the six officers, and the chairmen of four standing committees. The ten elected trustees are required by law to hold and supervise the property and investments of the Academy. The present building of the Academy was donated by the Carnegie Foundation of New York. The endowment of the Academy amounts to a little over two and one-half million dollars, nearly one and one-quarter million of which has been donated by the Rockefeller Foundation of New York.



Photos. Kenneth Clark

Plans on Back

NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



PLANS, NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



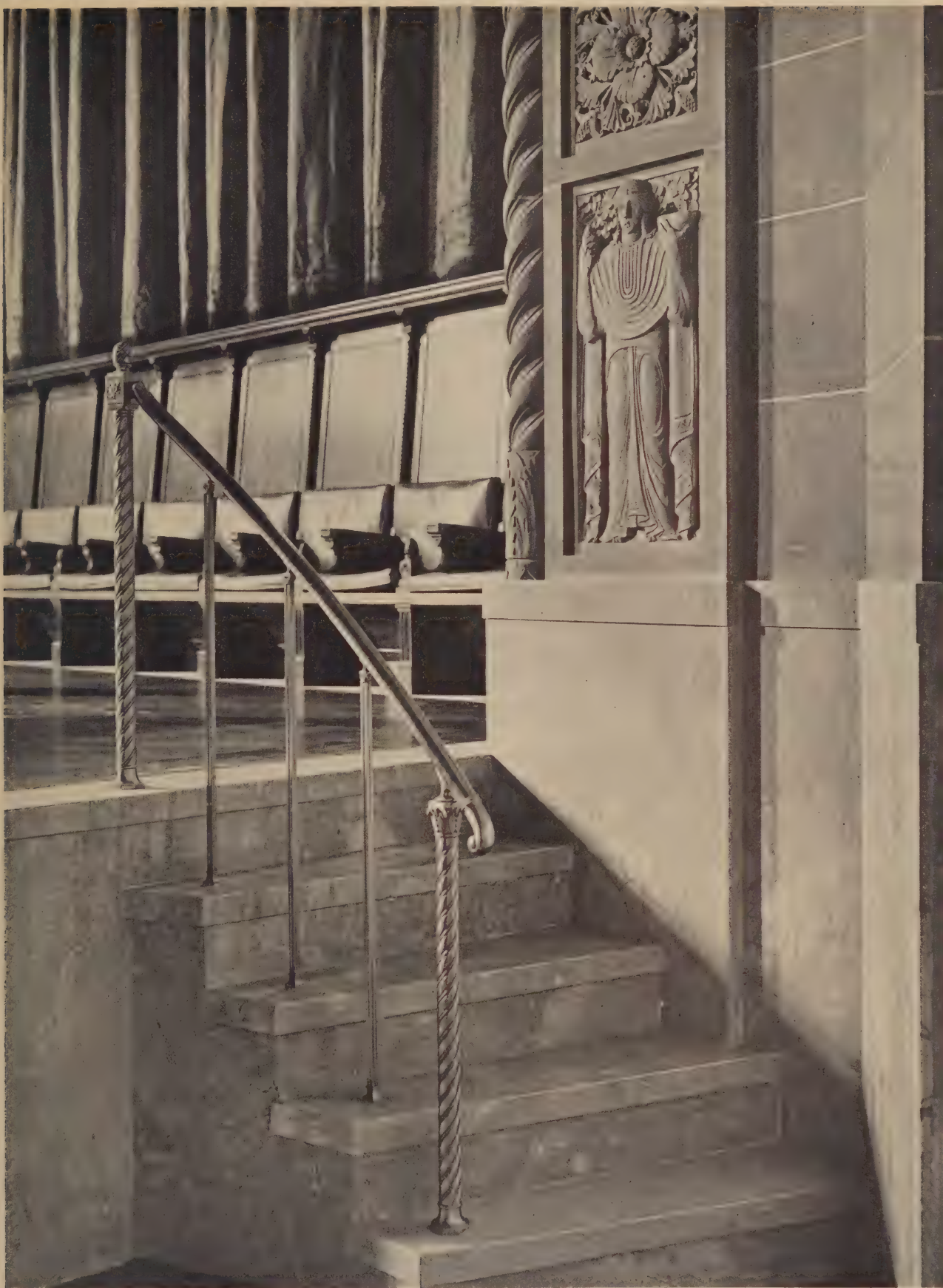
WINDOW ON FIFTH AVENUE FACADE
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



MAIN ENTRANCE
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



CORNER OF STAGE IN AUDITORIUM
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



STEPS TO STAGE IN AUDITORIUM
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



FALSE WINDOW IN AUDITORIUM
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



MAIN LIBRARY
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS



MAIN HALL, TOWARD ENTRANCE DOORS



MAIN HALL, TOWARD ELEVATOR LOBBY
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS

THE RUE MALLET-STEVENSON, PARIS

BY

PARKER MORSE HOOPER

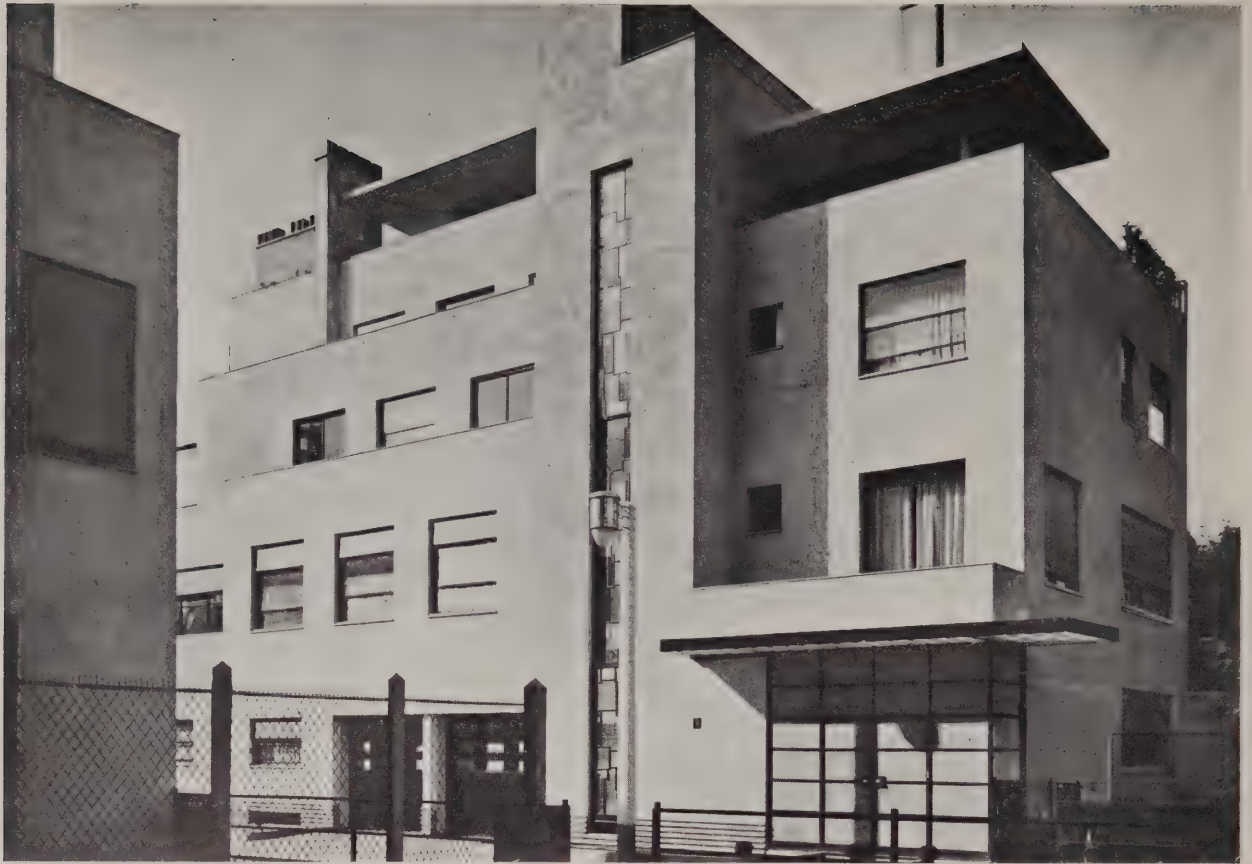
SOME call it "futurist," some "cubist" and some "ultra-modern," the style used in the design of the group of houses recently erected on one of the streets in the gay Quartier d'Auteuil by the well known French architect, Mallet-Stevens. The street carries the name of this intrepid designer, who has consistently and logically produced a group of outstanding examples of ultra-modern houses. It is as true of modern architecture as of modern decoration that to be properly appreciated and understood it must stand by itself in its own setting and environ-

ment. The flat, angular house, whose only claim to architectural design is in its proportioning and the spacing of its solids and voids, appears at a great disadvantage when surrounded by buildings whose design is based on architectural precedent. The same is true of modern furniture and decoration. They do not mix with the accepted styles of the past. So it was a clever idea of this disciple of ultra-modern architecture to build a street of houses entirely in the modern manner. Don't expect to find in this amazing thoroughfare any of the architectural styles



Photos. Bouney

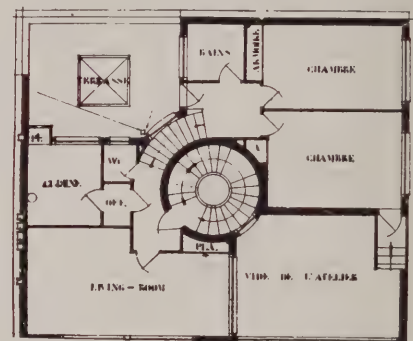
White Cement and Black Iron Railings Give a Nautical Effect to This Two Story Entrance Porch, Rue Mallet-Stevens



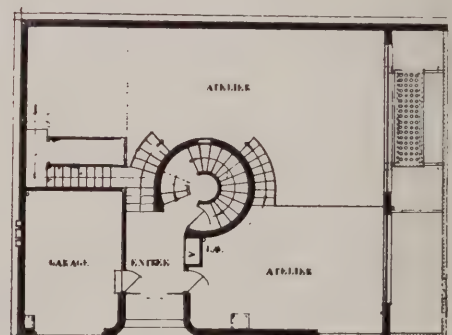
Emphasis on Horizontal and Vertical Lines, and Single Paned, Double Hung Windows Characterize the Design of this Modernist House, Paris, by Mallet-Stevens, Architect



Mallet-Stevens Stands for His Portrait in Front of One of His Modernist Houses



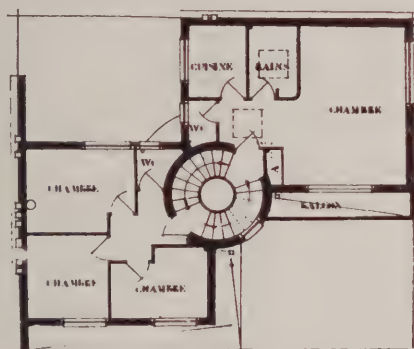
Second Floor



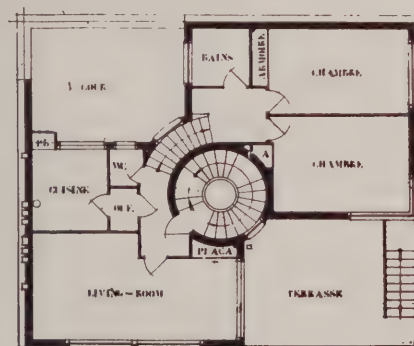
Plans of a Typical House
First Floor



Rear of Typical Right Angle Corner House, Rue Mallet-Stevens, Built by and Named After this Modernist French Architect



Second Floor



Plans of a Typical House
First Floor



Port Holes and Glassed-in Porches Give the Prevalent Nautical Note to this Modernist House by Mallet-Stevens

or *motifs* of the past. The new architects of Paris are as unwilling to use classic columns and carved cornices as are contemporary poets to sing of brooks and forests! Their inspiration comes from other sources, more in keeping with the commercial age of which these buildings are a concrete expression.

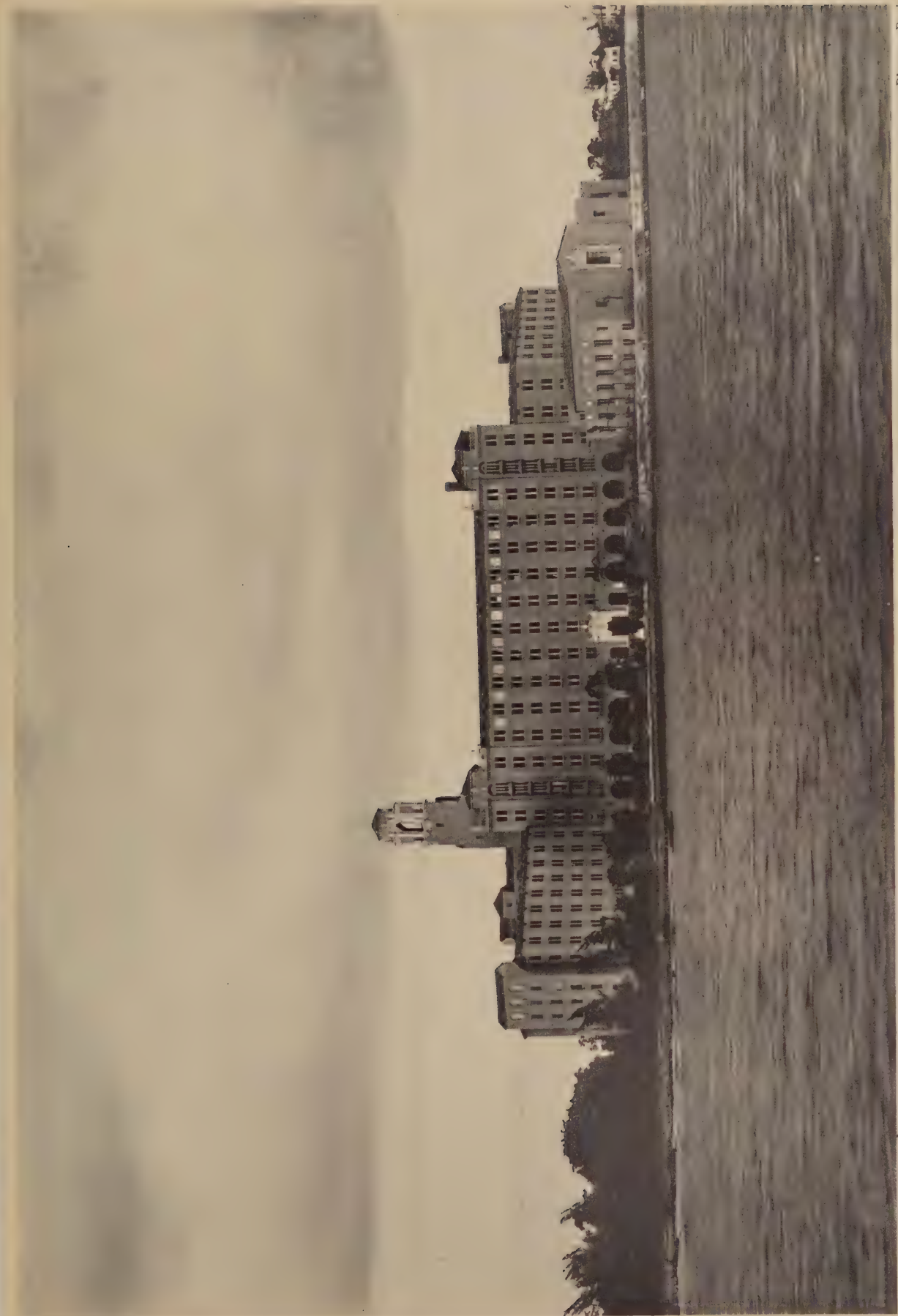
The inspiration of these modern houses is geometry. Rectangles, cubes, cylinders, circles and planes are combined with extraordinary virtuosity to give variety and individuality to these modernistic designs. To the uninitiated and unappreciative the lack of sloping roofs, overhanging eaves and the use of large and small windows, often closely grouped, give the impression that these are industrial rather than domestic buildings. A careful study soon prevents one from long remaining indifferent before these interesting examples of modern architecture. A deeper meaning soon reveals itself. The super-

position of cubes and rectangles of varying proportions creates an ensemble of beautiful simplicity. The relation of mass to mass and horizontal line to vertical fully establishes the intention of the architect.

The plan of a house is clearly indicated in the design of the elevation, almost as though each room in its three dimensions were a separate entity and placed above or next to other rooms in such number and arrangement as need and use might determine. It is an architecture of three dimensions. It is the zoning law applied to dwelling houses as well as to skyscrapers. It is the forerunner and will be the inspiration of the New York houses of the future under the new dwellings law. Whether or not we are at first shocked by the bareness, the angularity and the austerity of these modern French houses, the day is not far distant when these stepped and terraced buildings will be acceptable and agreeable.



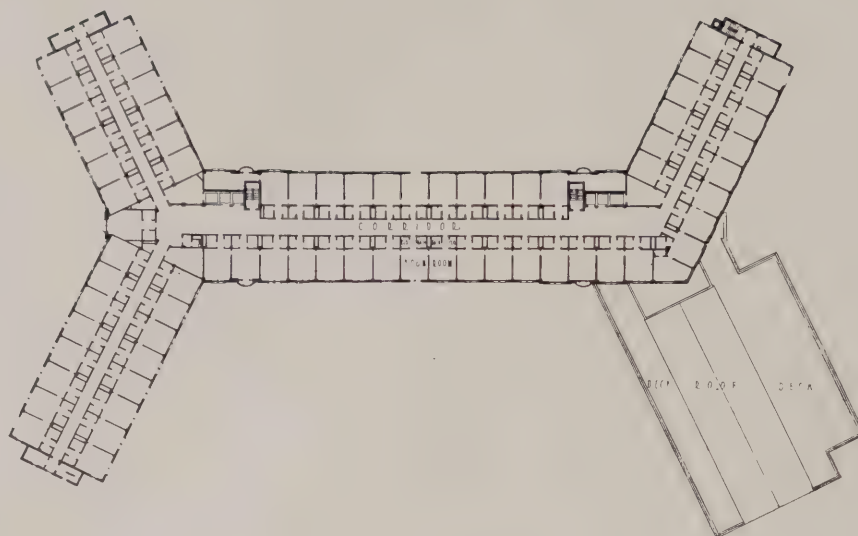
Plans of a Typical Five Story Modernist House, Rue Mallet-Stevens, Paris
Mallet-Stevens, Architect



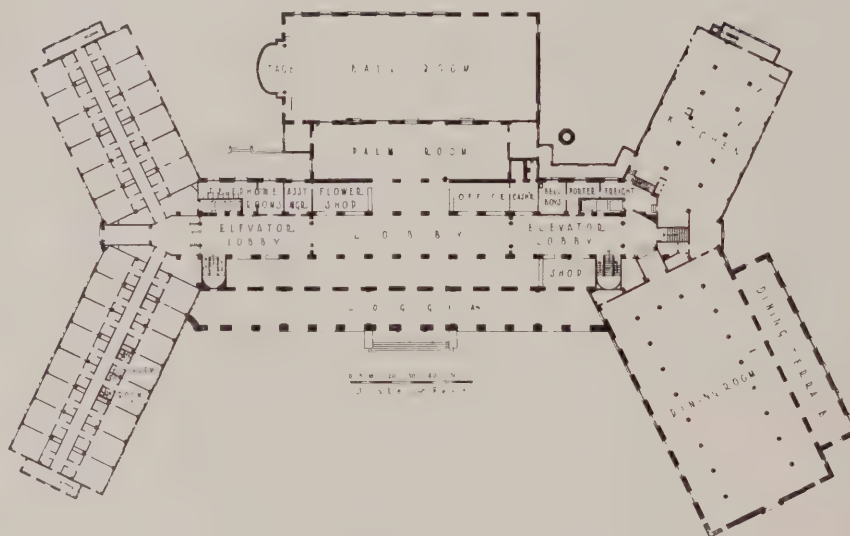
Plans on Back

VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT

Photos. Tobbs & Knell, Inc.



A TYPICAL FLOOR



FIRST FLOOR

PLANS, VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



SOUTHERN WING
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



MAIN ENTRANCE
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



MAIN LOBBY
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



ENTRANCE TO BALL ROOM
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



DINING ROOM
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT



PALM ROOM
 VINOY PARK HOTEL, ST. PETERSBURG, FLA.
 HENRY L. TAYLOR, ARCHITECT



DINING ROOM



BALL ROOM

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

PROPRIETY AND VARIETY IN THE GEORGIAN MANNER

A HOUSE AT HARTFORD

PHILIP L. GOODWIN, ARCHITECT

ONE of the most amazing things about Georgian architecture is the almost limitless scope of interpretation it permits both in the matter of composition and in respect of detail. If ever a mode has suffered from attempts to shackle it and confine it in a straitjacket of arbitrary conventions, it is the Georgian mode. From the time of Lord Burlington and his Palladian coterie right down to the present day, restrictive influence has been at work in one way or another. And yet the vitality of the Classic manner is not to be downed; it always re-asserts itself and gives fresh evidence of its inherent elasticity and fitness for clothing fresh conceptions.

There is just as much latent possibility in the Classic field,—Georgian and pre-Georgian,—as there ever was, and just as much scope for the play of ingenious invention without transgressing the proprieties. What man has done, man can do; and what the architects of the seventeenth, eighteenth and early nineteenth centuries did in the way of

creating varied interest of composition and treatment of detail, the architects of the present generation may do again if they choose to approach the subject with the same readiness of enthusiasm and the same spontaneity of imagination as did their predecessors. The way lies open; the will alone is needed to follow it to success. If the architect is thoroughly imbued with the Classic spirit and loyal to its doctrines, he may reserve to himself the liberty of blazoning the letters in a justifiably human and non-pedantic manner. So long as he recognizes and adheres to the fundamental *principles* of the mode in which he is working, he is free to heed the promptings of a vigorous though disciplined imagination in working on those principles, in brick and stone and wood. He will then discover that the mode supplies him with a plentiful repertoire of forms and precedents which he can adapt and combine and modify as fancy and occasion may dictate, so long as he does not contravene the principles upon which the mode is



House of James L. Goodwin, Esq., Hartford

Philip L. Goodwin, Architect



Detail in Main Hall

based. He will realize, too, that composition and detailing in the Classic mode need never be a poverty-stricken performance of fossilized conventions.

While a due recognition of the foregoing truths is of general pertinence to the employment of the Georgian mode anywhere, it is of particular importance to any architect using that mode in Connecticut. In no part of America is local Georgian tradition more firmly entrenched amid time-honored sanctions than in Connecticut. Nowhere is it more jealously regarded with deep respect; and it is right that this should be so, for the Connecticut version of the Georgian domestic manner is notably good. Any least departure from local precedent has therefore to be managed with considerable tact to avoid the risk of bringing in an element discordant with what is already in the field. It is not like going into a fresh territory, where one can, so to speak, create usage and establish precedent. There is always peril in putting "new wine into old bottles." Connecticut local Georgian tradition is so good, so strongly characteristic, and so prevalent that any noticeable departure therefrom, however excellent it be *per se*, is likely to be out of place. Nearly every old Connecticut village, in fact, is so deeply stamped with the hallmarks of local tradition that its homogeneous Colonial and Georgian atmosphere is not seriously to



Dining Room, House of James L. Goodwin, Esq., Hartford

Philip L. Goodwin, Architect

be disturbed even by the mid-Victorian crudities that once managed to edge themselves in as parvenus among their architectural betters. These present, at least, a certain uniformity of materials and color with the traditional types that helps to mitigate the discordance of their design; time has mellowed them, and the kindly growth of trees and shrubbery has further served to soften the harshness of their lines and in a measure to reconcile the eye to their presence.

Under the circumstances, then, this house at Hartford acquires a new angle of interest. As a piece of Georgian design it adheres sufficiently closely to Connecticut usage to satisfy rather exacting sanctions, and yet at the same time it embodies features that carry a completely fresh accent. The most noteworthy of these features are to be found in the extension from the main block of the dwelling comprising the service wing and garage, the sleeping porch contrived immediately above a half-hexagon bay on the ground floor, and the treatment of certain decorative details in the main hall and in the woodwork of the dining room. The service wing and garage are distinctly suggestive of Regency methods in the general proportions of their masses, in their stuccoed walls, and in much of the detail that marks their character. At the same time, they exhibit a flavor of French precedent that is happily combined with



Detail of Terrace Entrance



Dining Room, House of James L. Goodwin, Esq., Hartford
Philip L. Goodwin, Architect

their otherwise early nineteenth century British and American quality, a combination seen in certain old houses and always possessing elements of interest.

A sleeping porch, especially when it is obtruded on a Georgian design, is generally a *bête noir* and an eyesore as well; and it is nearly always an ultimately needless source of distress to the architect and the public eye, because a client rarely makes continued use of this deformity after he gets it. Nevertheless, Mr. Goodwin has contrived to make the sleeping porch in this instance not only as unobjectionable as possible but he has also managed to invest it with an appreciably individual interest. The very original method of ornamenting the piers will go far to divert mind and eye from the structural void behind. The arrowhead *motif* on a colored ground that appears in

the pilaster panels of the dining room doors, the pattern of the paneled dado with its triple sinkages, design of the dining room cornice, and the late neo-Classic quality of the woodwork and plaster ornament in the entrance hallway are all items of interior decorative architecture that exhibit original characteristics and may be examined with both interest and profit. The whole composition creates a pleasant sense of fitness to environment. This fact is perfectly patent from the illustrations, but, further than that, it is marked by considerate regard for regional sensibilities without surrendering liberty of action in either the major elements of design or in detail. The character of the house is considerably strengthened by thoughtful decorating and careful furnishing, which of course add much to its interest.



General View, House of James L. Goodwin, Esq., Hartford

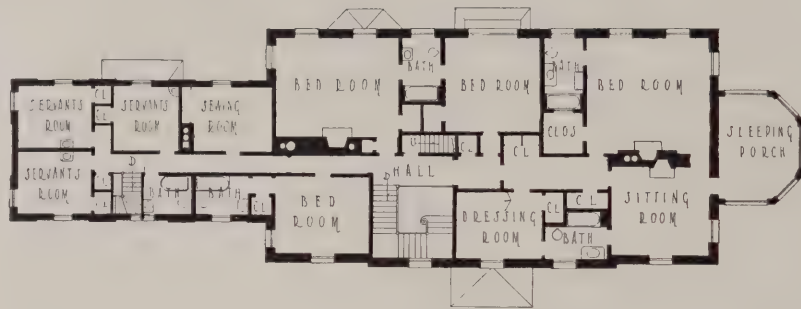
Philip L. Goodwin, Architect



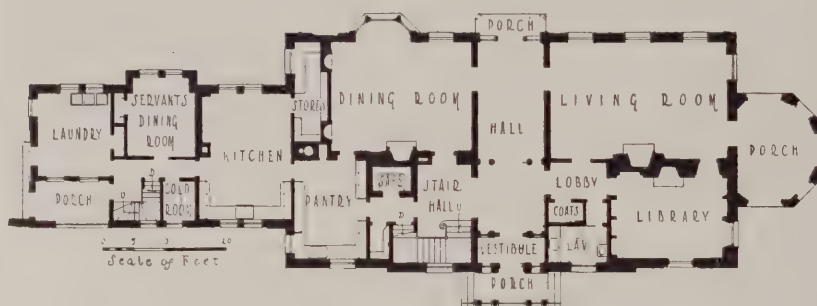
Photos. Amemya

Plans on Back

ENTRANCE PORCH
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



SECOND FLOOR



FIRST FLOOR

PLANS, HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



MAIN FACADE
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



SERVICE WING
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



ENTRANCE HALL
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



LIVING ROOM DOOR
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



DINING ROOM DOOR
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



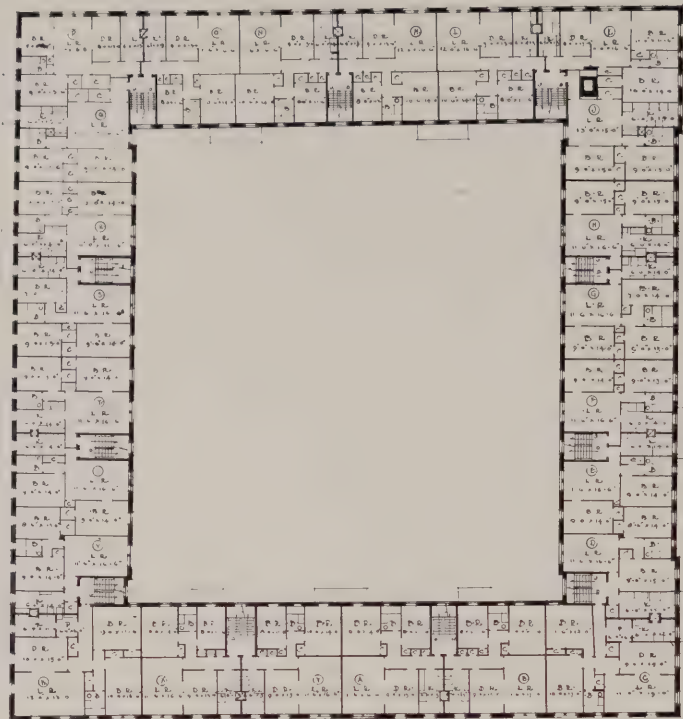
CONCOURSE FACADE



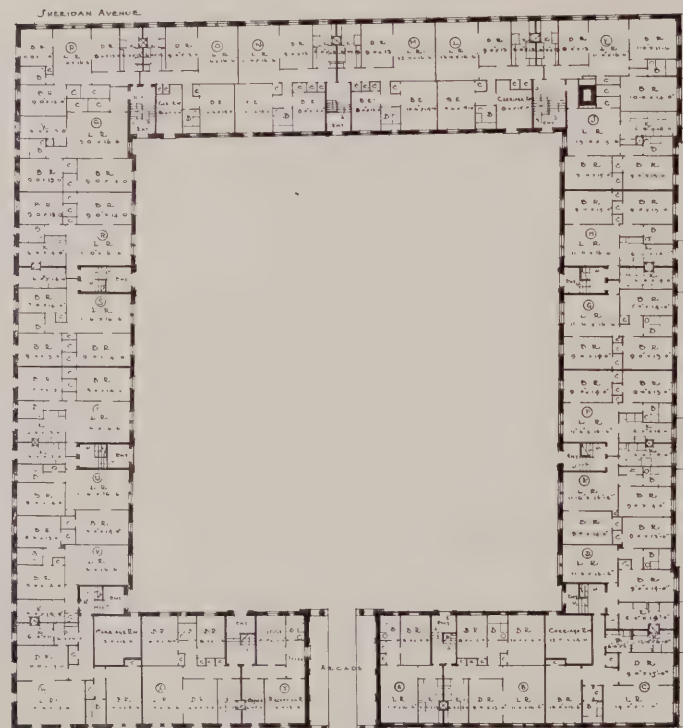
Photos. Kenneth Clark

Plans on Back

COURT FROM ENTRANCE DRIVEWAY
ASTOR CONCOURSE APARTMENTS, NEW YORK
AYMAR EMBURY II. ARCHITECT



A TYPICAL FLOOR



FIRST FLOOR

PLANS, ASTOR CONCOURSE APARTMENTS, NEW YORK
AYMAR EMBURY II, ARCHITECT

EDITOR'S NOTE. Awarded Honorable Mention, in the Six Story Apartment House Class at the Recent Annual Meeting of the New York Chapter of the American Institute of Architects



DOOR TO APARTMENTS IN COURT
ASTOR CONCOURSE APARTMENTS, NEW YORK
AYMAR EMBURY II, ARCHITECT



STREET ENTRANCE TO COURT

AN ARCHITECT IN MOROCCO, PART I

BY

EUGENE F. KENNEDY, JR.
ROTCH TRAVELING SCHOLAR

FEW corners of the old world remain unknown to the American architect and architectural student. In traveling abroad they have visited the most obscure places in their indefatigable search for romance, adventure, new ideas or inspiration. Their infinite curiosity has taken them to lands strange to the everyday tourist, and to towns and hamlets unheard of in countries that are comparatively well known. They have long ago ventured into northern Africa. Tunis and Algeria, as well as Egypt, are rarely omitted from their itinerary.

There remains, however, a new land, strange and fascinating, that lies but few miles south of Gibraltar and adjoins Algeria on the east,—Morocco, which but few have ventured to visit. Perhaps this is not to be wondered at; certainly the traveling conditions, even of today, leave much to be desired, especially to one traveling *a l'étudiant*, when one's pockets are not overlined with gold, and the practice of economy does not permit the best obtainable in hotels. Then again, this land has only recently been opened to the tourist, although it was conquered by the French in the not distant past of 1912. The advent of the World War left no room for thoughts of architectural exploration, nor did a certain Mr. Abdel-Krim make it a safe place for the peaceful brush wielder, when he decided it was about time for another war. However, now that Mr. Krim is safely but a romantic memory, I venture to suggest it as a fitting addition to the itinerary of those who are planning a tour of the old world and who wish to wander from the beaten track of the Cook's tourist.

In rendering an account of its strange people, fascinating customs, and exotic architecture, it may be well to start not at the very borders of Morocco, but a few leagues eastward,—in Algeria, where my trip started, and where it is likely any trip may start. Oran, in Algeria, is the French Mediterranean port of Morocco, though in itself it has nothing of uncommon interest to offer those who have visited the cities of Tunis and Algiers,—more magnificent and quite as picturesque,—but it is from here that we embark westward for Tlemcen, on the first lap of our trip to the land of the Moors.

The train carries us through a stern, rugged country, strangely unlike the calm, voluptuous Africa of our imagination, and comparable in severity only to the Andalusian mountain districts of Spain. Here we cross a barren plain, there we slowly climb the slope of a steep mountain. We skirt perilous cliffs, and gaze in rapt admiration at some deep ravine, until our view is obliterated by an inopportune tunnel. Emerging, we zigzag down the mountainous descent to find ourselves once more in the lap of a plain as barren as the first. The barbarian character of the

earth is appalling,—a sterile, blood-red soil, and sienna colored rocks, interspersed with a few scraggly low bushes, or tiny clumps of stunted olive trees, warped and twisted as though in anguish at the cruel fate that set them there. Rarely do we see any signs of humanity, and then only in the form of strolling bands of Bedouins, or here and there a lonely herdsman watching over a herd of grazing camels. Upon a hilltop, silhouetted against the setting sun, a solitary horseman dismounts, and prostrates himself at his evening prayers. The fierce grinding of brakes, followed by a sudden, savage jerk of the train, warns us that our destination has been reached. Out we tumble, bag and baggage, to be assailed by hordes of dirty Arab porters, fighting to gain possession of our luggage. Breathlessly we escape from the melee by tumbling into a waiting hotel van,—an antiquated flivver with a rheumatic appearance and an asthmatic cough. No matter. Amid squeals of brakes and springs, the deafening clatter of loose windows and fenders, it plows its way through the crowded streets and stops before the door of our hotel. The less said about the hotel the better. I would not allow my bitterest enemy to spend a night there. Since, I have learned that there is a good hotel in Tlemcen;—it certainly is not the house I chose.

While we are still in Algeria, Tlemcen is distinctly unlike other Algerian towns. To be sure, some few European inhabitants have taken up their residence within its walls, but it is so far beyond the reach of a wide European civilization as to be almost wholly oriental in character. We spend some time exploring the city, peering into strange corners, wondering at the surging crowds of swathed natives, and visiting the mosques and the *medersas*. The mosques in and about Tlemcen are the last we are permitted to enter, for once the borders of Morocco are crossed, we must be satisfied with a hurried glance through the doorways. Let us enter the grand mosque. An attendant comes to the door at our bidding, slips a pair of enormous heelless slippers over our shoes and suffers us to enter. With difficulty and extreme good fortune we manage to keep them from slipping off to lose themselves on the matted floor of the interior. We find ourselves in a huge arcaded hall, supported by a forest of piers. The floors are covered with a woven matting, and the whitewashed walls are encrusted with delicate carving. Here and there a lamp of brass and colored glass sends a weird glow into some obscure corner, or over a squatting Mussulman, who prays or reads from the Koran, unaware of the picturesque appearance he presents with his shoes placed neatly beside him. The inevitable courtyard is a large rectangular affair, surrounded by horseshoe arches, and paved with tiles.



A STREET IN THE MEDINA, FEZ-EL-BALI
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.



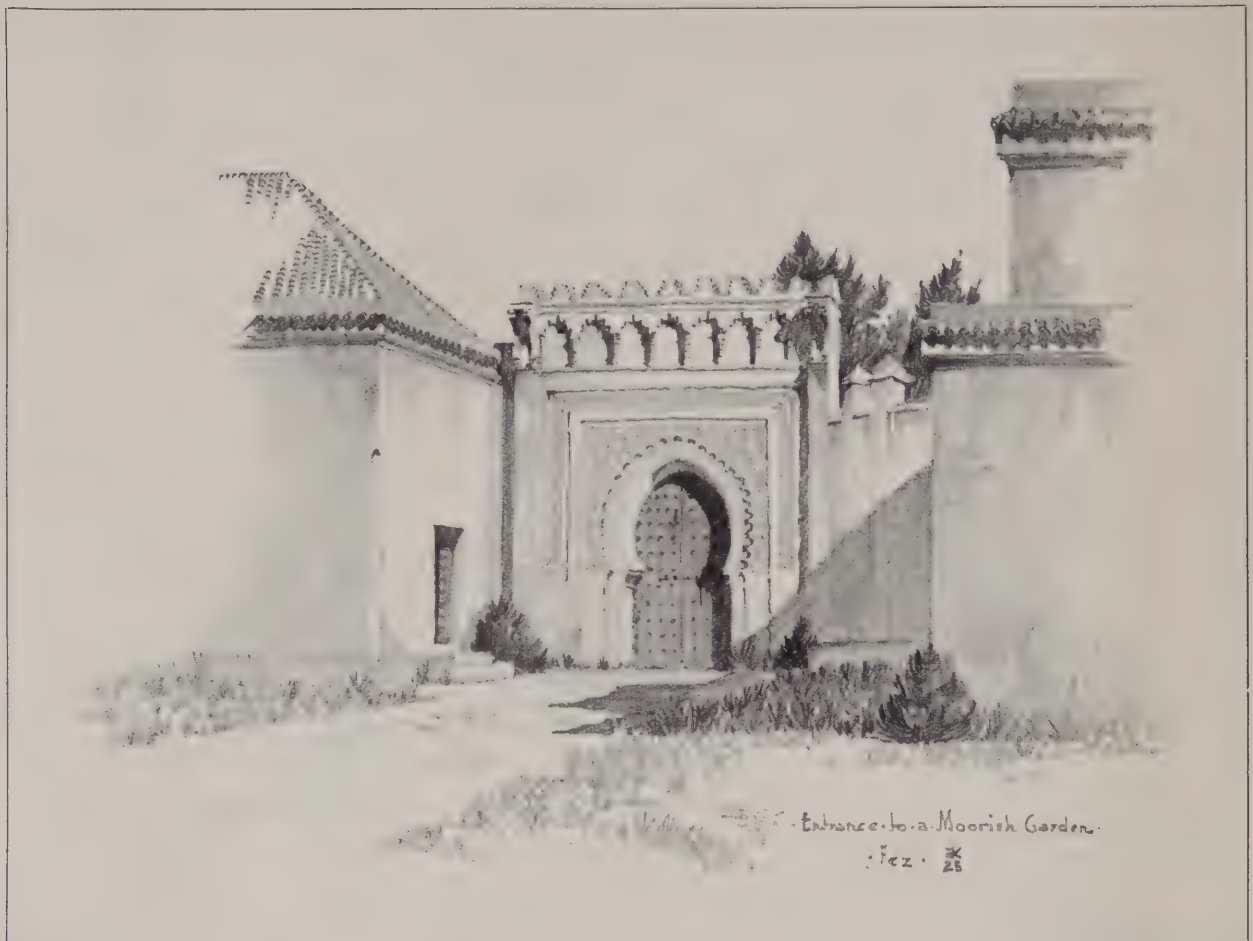
RUINED PALACE AND MINARET, SIDI-BOU-MEDINE
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.



BAB MARSOUR EL ALEUJ, MEKNES
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.



STREET SCENE, FEZ-DJEDID
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.



Entrance to a Moorish Garden, Fez

From a Pencil Sketch by Eugene F. Kennedy, Jr.

From the center of the courtyard there rises a ceramic fountain, sending heavenward a thin jet of sparkling water, which falls noisily into a rectangular basin.

Without a doubt, the most interesting of the sights one sees at Tlemcen is the tiny village of Sidi-Bou-Medine, perched upon a hilltop, not more than a mile distant from the walls of the larger town below it. Nothing could be more oriental than this tiny village. It is entirely Mohammedan, and the vast ruins of an ancient palace and an exquisite minaret attest to its departed glory and importance. We leave Tlemcen with a sigh. We could easily have gone on exploring its charming mysteries, but the pleasant taste it has given us makes us the more eager to push onward to enjoy presently the far-famed beauty of Fez.

The train takes us as far west as Oudjda, where we are at last within the borders of Morocco,—and what a disappointment our first view of it is! The dust of the streets arises to choke us, and the incomparable filth and squalor of the native quarters send us back nauseated to the more habitable if less picturesque European section.

It is without regret, therefore, that we are awakened at 3 o'clock upon an icily cold morning to take the bus for Fez. Our tickets had been purchased the previous day, when the attendant who sold them

assured us that there were none better at any price. Despite this, we find ourselves sandwiched in among a motley but picturesque gathering. The Arab who occupies the space to our right and on the outside is to be strongly suspected of naïve innocence of soap and water beyond the bare requirements of his religion, that requires him to wash his feet every Friday. On Thursday, however, it is difficult to associate the idea of cleanliness with the Mohammedan faith. The two live chickens he holds by their feet on his knees squawk in unison throughout the journey, and periodically flap their wings either in a futile attempt to escape or in complaint of their discomfort. On our left sits a huge negress, not only bulging beyond the limits of her clothing, but over her immediate companions as well. A pleasant soul she is,—every askance glance at her is rewarded by a broad grin, that stretches from one ear to the other, exposing a flawless set of snow-white teeth. What a ride! It is frightfully cold in this part of Africa until sun-up, and the cold wind nearly freezes us. The combined odor of man and fowl, from which there is no escape, spread as it is by the strong wind, is anything but pleasant. The overlapping portions of the female are nowise comfortable, while the undeniable presence of fleas, with no scratching



Entrance to the Ruined City of Chellah, Rabat

From a Pencil Sketch by Eugene F. Kennedy, Jr.

room, gives us much to think about during the seven hours we spend in traveling between Oudjda and Fez.

As far as Taza we drive over vast wastelands, the nearest approach to a real, honest-to-goodness desert we see. An occasional roving band of natives, and a French fort, garrisoned by coal-black Senegalese troops, are the only evidence we see of human habitation. Beyond Taza the prospect becomes more pleasing. Soon we reach the rings of hills that separate us from Fez. Climbing, descending, skirting a deep ravine in serpentine fashion, we are in constant fear that the least slip will send us tumbling down the steep inclines. Not so the driver; he carries on a nonchalant conversation, his eyes resting more often on the young woman by his side than upon the tortuous road before him! After reaching the height of the last range of hills, we round a corner to get our first glimpse of Fez. What a sight to behold! The sparkling white city, nestling in a cup of land, is spread like a map at our feet, many meters below us. The nearer hills are covered with the silver green of the olive trees and cactus. The more distant hills to the north have a barren, burnt air, while away to the south, the lofty Atlas mountains lift snow-clad summits which seem to extend to the sapphire heavens.

It is quite impossible to put the beauty of Fez into

an expression of words. To use the superlatives really necessary to describe its exotic atmosphere would only create the suspicion that I am a real estate promoter! It is even less possible to capture its beauties with the aid of a pencil, for that medium portrays only a tiny, insignificant corner here and there, whereas every inch of the remarkable city is as fascinating as can be imagined. The subjects too, are a riotous mass of color, impossible to indicate in black and white. Our first glimpse of its busy street crowds, for the moment, all thoughts of architecture from our minds. Our attention is undividedly claimed by interest of the humanity that surrounds us. The first impression is one of extreme bewilderment; we know not which way to turn or what to do. In vain do we spend precious moments in consultation with Mr. Baedeker's maps. They tell us nothing,—we are engulfed within a maze where everyone but ourselves knows exactly where he is going. A little shamefacedly we accept the services of a guide, a handsome youth, arrayed in a long sapphire burnoose and coiffured by a red fez with a long black tassel. His services, until we form some idea of the orientation of this labyrinth, are most necessary, as one glance at the complicated twisted mass of *cul-de-sacs* shown on the map will prove. To begin with, Fez is divided

into three different and distinct sections. The largest portion, called "Fez-el-Bali" or "Old Fez," is separated by a distance of some 500 yards from "Fez-Djedid" or "New Fez," which was founded in the thirteenth century. The real new Fez or European city is situated about half a mile southeast of Fez-Djedid. Incidentally, this newest Fez, which in plan is the only part that seems to have any rhyme or reason, enters not at all into our present description.

Starting from the new port of Bou-Jeloud on the outskirts of Fez-el-Bali, the handsome youth of the sapphire *burnoose* conducts us to what appears to be the only main street of the city,—Rue du Tala. It is not more than 15 feet wide—if that—and resembles only a surging sea of colorful humanity illuminated by dazzling, animated spots of sunlight that creep through the crevices of the trellis covering above. We are carried by the surging crowds back to the days of Aladdin and his magic lamp. Unfolded before our eyes are all the tales of the Thousand and One Nights rolled into one. We pass from a patch of brilliant sunlight into the blinding obscurity of the shadows. We are pressed against leprous walls, which like the blind beggars who squat at them are largely innocent of windows, but are here and there pierced by some haughty portal of a mosque or *medersa* or the more humble windows of some dwelling. Now we come to a section of the street lined with tiny, cell-like shops, called *souks*, and here it seems the confusion is more intense than elsewhere. Our ears are humming with the mighty din of a thousand voices. Merchants sitting crosslegged amid their wares bargain lustily with a group of prospective buyers, each trying to outdo the other in vocal fervor, while porters loudly berate their lagging donkeys. Everyone seems occupied in yelling at the top of his lungs, and above all this din comes the shrill clanging of the water bearer's bell. Our nostrils are assailed by the odor of burning grease, intermingled with the aromatic odors of spices. The odor of man is no less predominant than the odor of animal; in fact, no one odor predominates. Each is as potent as the other, and together they form the odor of Fez. May a like odor never assail my long-suffering nostrils this side of its unique source!

Now and again, some haughty cavalier, arrayed in his fine, immaculate *burnoose*, rides through the fevered crowd astride a richly caparisoned mule, his eyes flashing above a trim beard. Immediate passage is made at his stern cries of "Balek-Balek," but, as water fills the place occupied by a withdrawn object, so does the crowd surge in upon him as he goes by. Half-naked negroes, beggars in rags, jostle us. Indescribably filthy children, and veiled, white-clothed women, wend their way through the tide of restless

humanity. Black men, brown men, men almost white; clean men, dirty men, pleasant odors, nauseating odors, mules, donkeys, dogs, strange sounds, shrill yells,—all these serve to make up the street life of Fez. A constantly varying mob, of no rhyme nor reason, scurrying here and there, afoot, or astride—as far astern as nature permits—of shaggy donkeys! As the day grows old, the steady roar of the street diminishes, and from the tops of the minarets comes the *muezzin's* call, repeated by the rabble below.

An excursion through this maze of twisted alleyways is a succession of surprises. We are greeted at the turn of this corner by a ceramic wall fountain, in the most fantastic and beautiful design. We issue forth from under an archway, to be confronted by a stately minaret of brick and tile, that rears itself from out the squalid buildings at its feet, while a bud-shaped dome beside it is strongly silhouetted against the azure sky. Here we come upon a magnificent portal of a mosque, or a *medersa*. If it be of the former, we must content ourselves with a hasty glance through it, but this happens to be that of a *medersa*, and our Christian feet are suffered to enter. Before doing this, it might be wise to mention that a *medersa* is a college to which the young men of the Empire come, to learn the Koran; in other words, it is a theological school of Morocco. Passing through a superb bronze doorway and up a few steps of faience and marble, we find ourselves in a tile-paved, rectangular court. The dado is composed of innumerable tiles of many colors, arranged in a most intricate diaper pattern, and capped—at about eye-height—by an Arabic inscription of black and white tile. Above this chiseled plaster walls recall to our minds a piece of ancient Brussels lace. Can this possibly be the work of man? Some time ago, we marveled at the delicacy of the plasterwork of the Alhambra in Spain, but that is coarse and heavy in comparison to these cobwebby walls of Morocco. The windows of the upper stories, admitting light and air to the cells of the students living there, are covered with lattices of spun wood, resembling thousands of spools joined together in criss-cross designs. Crowning all this, and enframing the cloudless blue of the heavens, is a heavy cedar cornice, supported on huge brackets and stalactites, delicately carved—as though in rivalry with the plasterwork below—and once covered with brilliant colors, long since departed with the weather of yesteryears. Our gaze descends to rest upon the placid waters of the rectangular pool in which all this minute beauty is reflected. This is a description of all the *medersas* in Fez, yet it is a description of no one in particular. They are all varied, one from another, in a wide array of designs and *motifs*, wherein lies much of their charm.

SMALL BUILDINGS

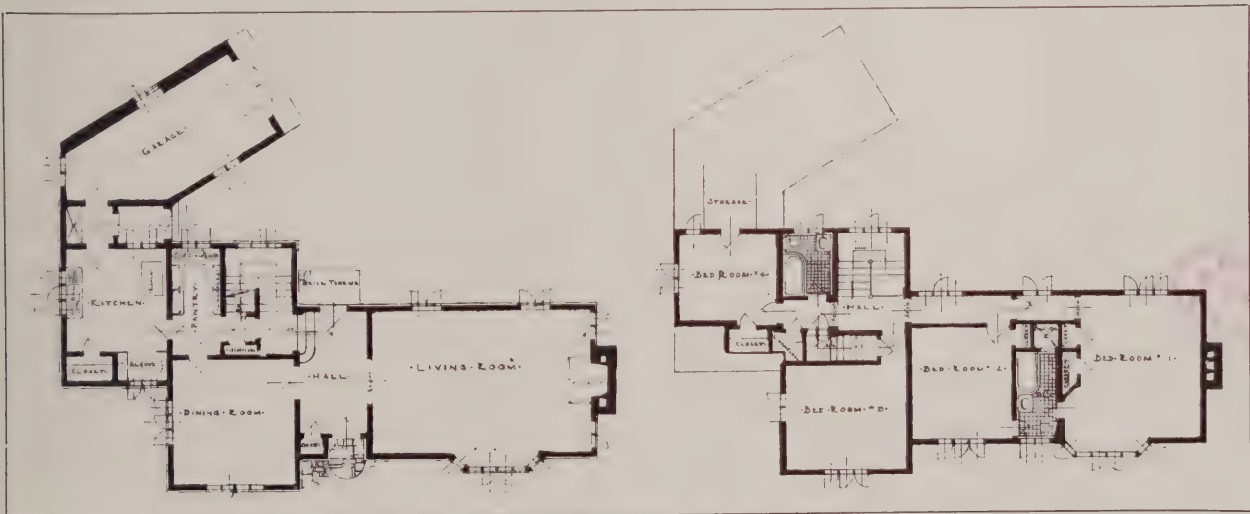


Photos. John Wallace Gillies

HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

ON a rocky and wooded hillside in one of the popular residential districts of Westchester County, among the many attractive houses recently designed and built by Lewis Bowman, architect, the house of Frank Harwood, Esq., has many interesting and artistic features. A combination of wood

veneer and stucco on wire lath and wood frame, there is an undeniable charm about this simple, straightforward English design. The metal casement windows are well proportioned and properly spaced, giving wide wall surfaces to catch the filtered shadows of the foliage surrounding the house. The



FIRST FLOOR

SECOND FLOOR



STEPS LEADING FROM THE ROCK GARDEN UP TO THE ENTRANCE TERRACE
HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT



ENTRANCE TERRACE
HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT



LIVING ROOM

HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT



ENTRANCE DOOR

roof has a height and a pitch sufficiently steep to add character to the design and to permit comfortable rooms on the third floor. The dormers which light and ventilate these rooms do not appear on the front elevation. Rich greens and dull browns and reds are the color stains of the shingles used to produce a marked contrast between the high roof and the severely plain stucco walls. The texture of the stucco itself is exactly right, being neither too rough nor too smooth. In the illustrations the excellent texture of the stucco can be studied and appreciated. In its total lack of ornamental detail, such as door and window trim and cornices, this house suggests the best type of modern English domestic architecture. It might well have been designed by such a master as Sir Edwin Lutyens. The shallow bay window with its overhanging roof pleasingly breaks the long sweep of the front facade. The projection of this bay is repeated with greater emphasis in the dining room wing, which makes a strong terminal feature at one end of this facade. The flagstone entrance terrace is successfully separated from the wilderness of outcropping ledges and underbrush by a low fieldstone wall. Rough stone steps lead from this terrace to a rock garden, appropriately located in the midst of the woods. Regarding the equipment of this house, the architect reports that an oil-burning hot water system was used for heating. Paint instead of wallpapers was used on the interior walls for decorative purposes. The design of this house could hardly have been more successful.



HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT



FIRST FLOOR

THIS typical English stone house was designed with the idea that when finished it should appear to belong on its site, and that it should give the impression of having been designed for the picturesque location where it stands. To achieve this purpose, the Cotswold type of English manor house was chosen as being particularly appropriate for use in a rugged and well wooded type of country. The materials used were rough fieldstone, laid up to a fairly flat surface, and rough-finished stucco. The stone used was taken from the site and broken up so as to lay to fairly horizontal joints. There is undoubtedly more variety of color and greater textural charm in this type of stonework than is found in the carefully laid, smooth-finished stonework of the Cotswold cottages. In regard to the construction of this unusually picturesque and artistic house, the architect says that rough-textured slate was used for the roof, white wood detailed in the early Georgian style for the interior finish, oak in antique finish for the floors, and a vapor system for the heating. The house was completed in July, 1921 at the cost of approximately 65 cents per cubic foot.



MAIN ENTRANCE

HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.

W. STANWOOD PHILLIPS, ARCHITECT



GARDEN ENTRANCE

HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT



WILD GARDEN ADJOINING HOUSE
HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT



Photos. Frances Benjamin Johnston

HOUSE OF MRS. JAMES M. TOWNSEND, GREENWICH, CONN.
EDWARD CLARENCE DEAN, ARCHITECT

ON a rocky knoll near the end of Mead's Point, looking out over Long Island Sound through trees a century old, stands this simple and homelike English house. The many casement windows, the tiny covered porch, the hospitable looking brick-based bay window and the recessed loggia on the second floor are the salient features which give

charm and individuality. The general construction was stucco on wood lathing above stone and brick foundations. The roof is covered with black slate, metal casements were used, the floors are oak and composition, and heating is by hot water. Completed in April, 1926, the cost of the house was approximately 75 cents per cubic foot, or about \$32,000.



FIRST FLOOR

SECOND FLOOR



SERVICE ENTRANCE AND GARAGE



FIREPLACE IN LIVING ROOM
HOUSE OF MRS. JAMES M. TOWNSEND, GREENWICH, CONN.
EDWARD CLARENCE DEAN, ARCHITECT

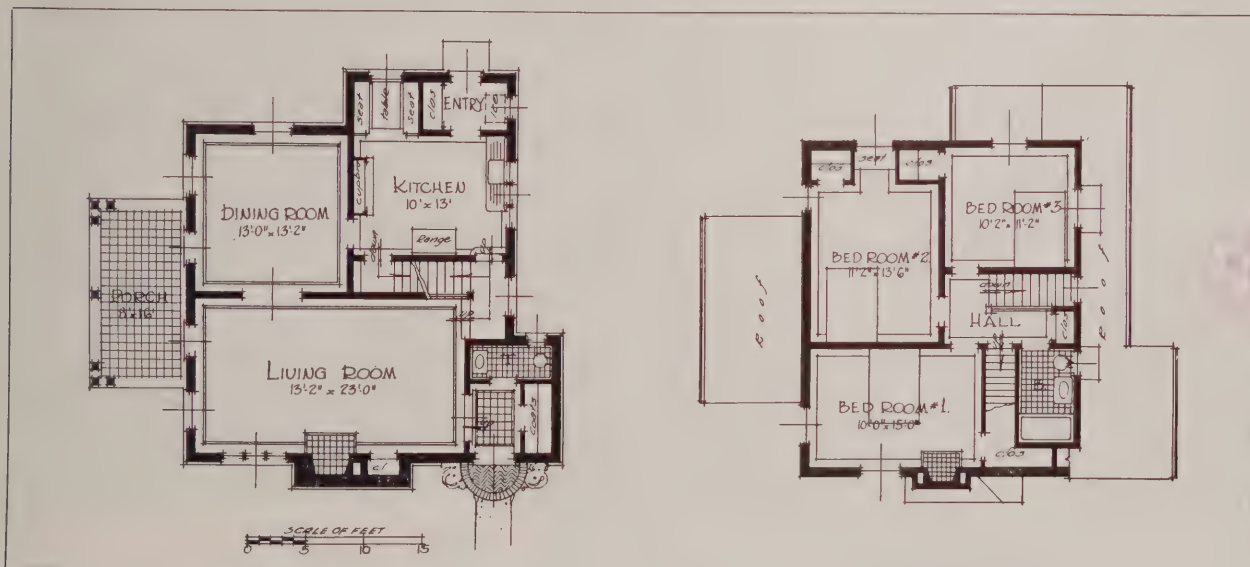


HOUSE IN STUCCO AND HALF TIMBER, BAYSIDE, N. Y.

R. C. HUNTER & BRO., ARCHITECTS

HERE is another interesting example of an unusually picturesque house in the English style. Characteristic of English and French farmhouses, the windows are small and few. One of the successful and artistic features of the design is the closed-in living porch, the roof of which is a continuation of the steep pitched roof of the house it-

self. Constructed of hollow tile covered with stucco, with wood shingles used for the roof and wood casements for the windows, chestnut for the interior millwork and rough plaster for the interior wall finish, it was possible to build this house at a cost of 50 cents per cubic foot, or about \$13,900 in 1927. The cubic contents are 27,800 feet.



FIRST FLOOR

SECOND FLOOR



SOUTH END AND ENTRANCE DOOR
STUCCO HOUSE IN THE FRENCH STYLE, BAYSIDE, N. Y.
R. C. HUNTER & BRO., ARCHITECTS

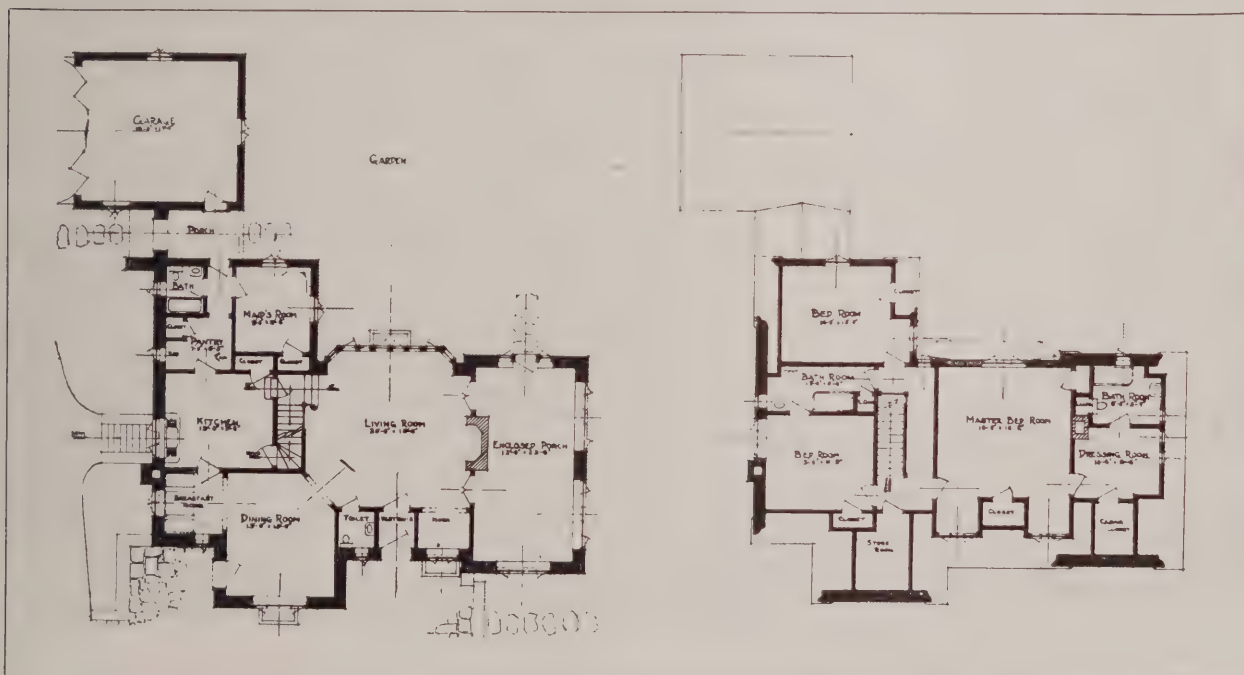


Photos. George H. Van Anda

HOUSE OF W. H. DEWAR, ESQ., JENKINTOWN, PA.
HENRY L. REINHOLD JR., ARCHITECT

THE many gables of this low and homelike stone house suggest the Cotswold cottages, but the character of the stonework and the large casement and dormer windows are more American in appearance than English. The house and garage, which are connected by a small loggia or porch, are well grouped as regards both the utility of the plan and the beauty of the general proportions of the whole group. It is well designed in relation to its sur-

roundings, and seems to spring naturally from the meadow in which it stands, this effect being secured partly by the use of an informal rock garden surrounding the house. For the most part, the exterior walls are of local quarry stone, with green, purple and brown slate roof. The interior trim is of yellow poplar, with special English oak trim in the living room. The building was completed in 1927 at a cost of \$24,971, or about 45 cents per cubic foot.



FIRST FLOOR

SECOND FLOOR



ENTRANCE TERRACE
HOUSE OF W. H. DEWAR, ESQ., JENKINTOWN, PA.
HENRY L. REINHOLD, JR., ARCHITECT



Photos. George H. Van Anda

HOUSE OF ANTON WALDEIER, ESQ., BELLEROSE, N. Y.
ANTHONY J. C. WALDEIER, ARCHITECT



FIRST FLOOR

SECOND FLOOR

THE first thing that will strike one on examination of this illustration is the unusual treatment of the chimney, where the bricks of varying sizes are laid in haphazard fashion. The effect produced is rather bizarre. The details of the rest of the house are fairly conservative and in keeping with good English precedent. Although the dormers are pleasantly generous in size, the windows in them are sufficiently small to give the proper English note. In designing small houses in the English style,

American architects should remember that in the English prototypes the windows are usually small. In a climate blessed with sunshine only a few days out of the year, small windows are practical, since the smaller they are the more cold and dampness they keep out. One of the advantages of using the English country house style for American small houses is that it is convenient and appropriate to use casement windows, which provide the maximum of fresh air when opened, as well as maximum light.



ENTRANCE TERRACE

HOUSE OF ANTON WALDEIER, ESQ., BELLEROSE, N. Y.
ANTHONY J. C. WALDEIER, ARCHITECT

INTERIOR ARCHITECTURE

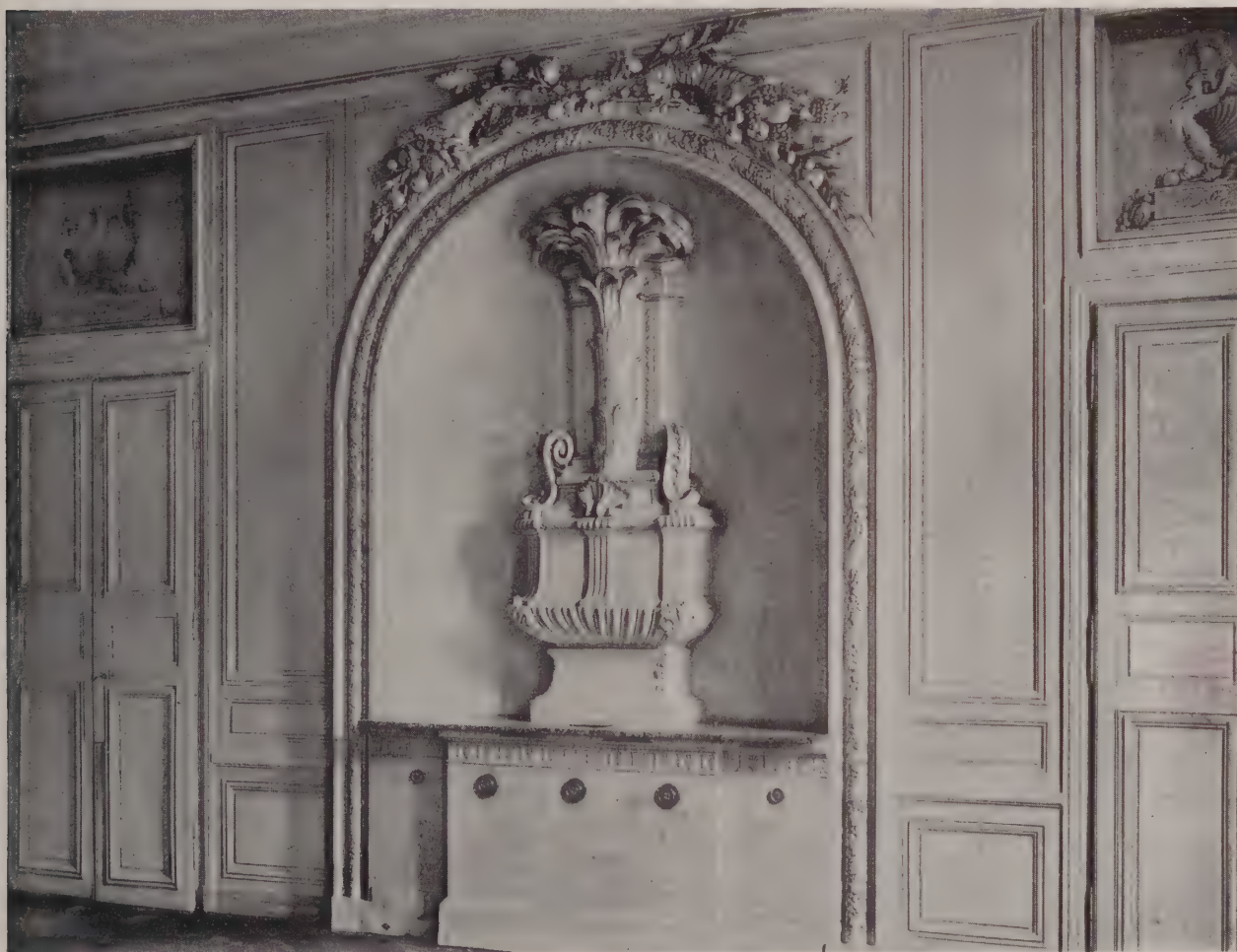
HOTEL GOUFFIER DE THOIX, PARIS

TEXT AND MEASURED DRAWINGS BY C. HAMILTON PRESTON

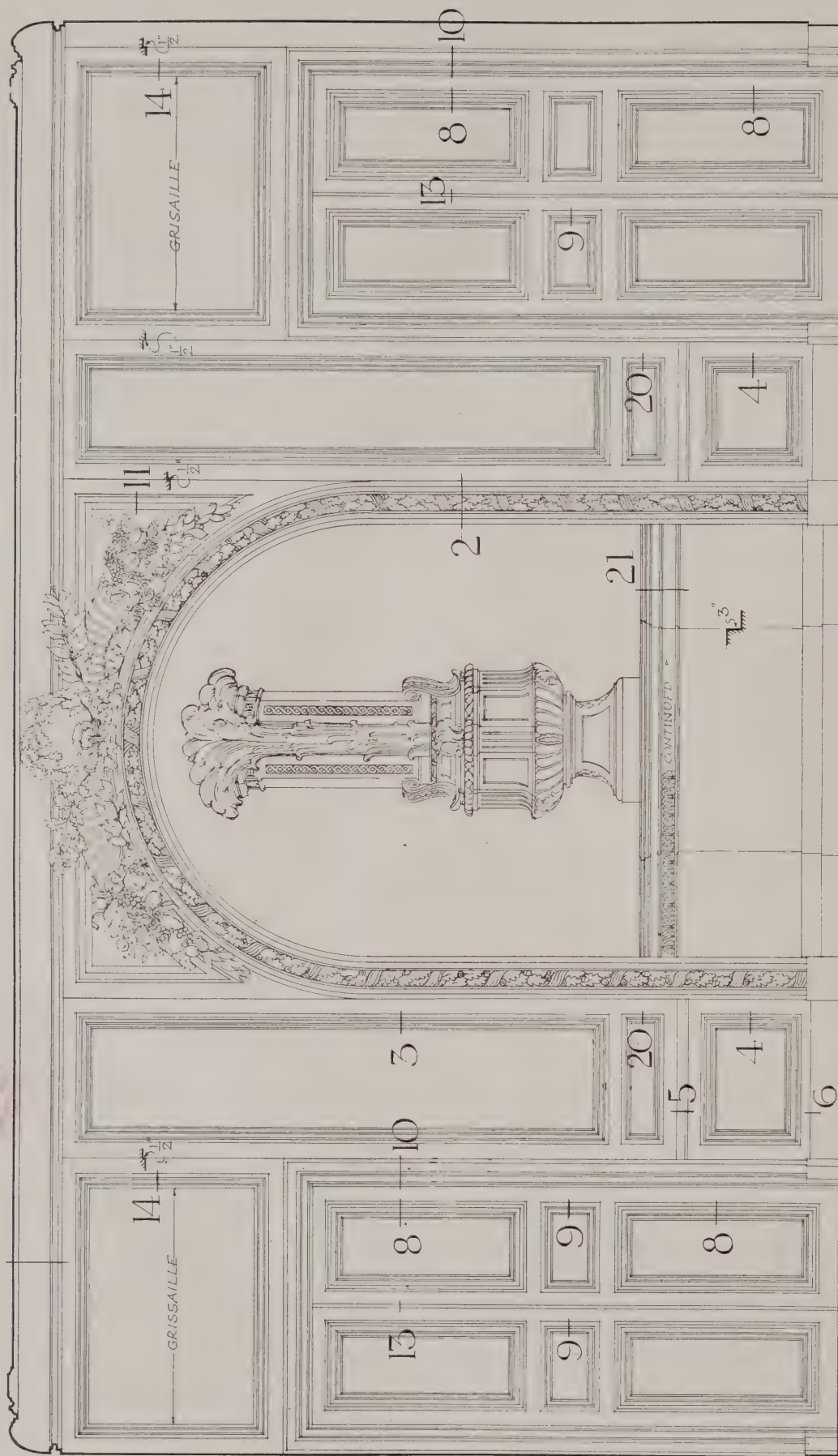
HOTEL GOUFFIER DE THOIX, 56 Rue de Varenne, was built about 1746 by Gouffier, Marquis de Thoix, a man of great fortune, which he had inherited and to which he added greatly by a very advantageous marriage. Like so many of the hotels in the grand manner of the Faubourg St. Germain, the Hotel Gouffier de Thoix is very imposing, grandly planned, and distinguished in design. Although the interiors throughout are most sumptuous, the subject of our sketch stands out from all the others by its almost severe plainness and the boldness of its conception. One can with difficulty judge from the illustration the scale of the room, with its niches; hence the value of scale drawings and details.

The paneling, mouldings and cornice are simple and vigorous, and the design symmetrical and balanced. Over the doors occur simple designs in *grisaille*, and nowhere in the room, except in the niches, is there any attempt at decoration. But the niches are remarkable for their size, boldness and

vigor. The large architrave mould is richly ornamented in its middle member with an oak leaf *motif*, while over the arch is a most extraordinary decoration, a composition of cornucopias, wreaths and sprays of laurel and oak leaves. The whole design is tremendous in scale and assertive to the last degree. In one of the niches is placed a very decorative porcelain stove, beautiful in design, while in the other is a huge fountain vase of rare design and ornamentation. Both these niches are painted unusual pastel shades of light red, yellow, green and blue, while the walls of the room are gray. The marble floor in black and white with an octagon and square design, is very elegant. Another feature is the built-in portions of the niches with marble tops which serve as a base in either case for the stove and the fountain vase. There is probably no Louis XVI interior in all France so commanding in scale and so vigorous. At the same time it is restrained, and creates an impression of quiet taste and dignity.



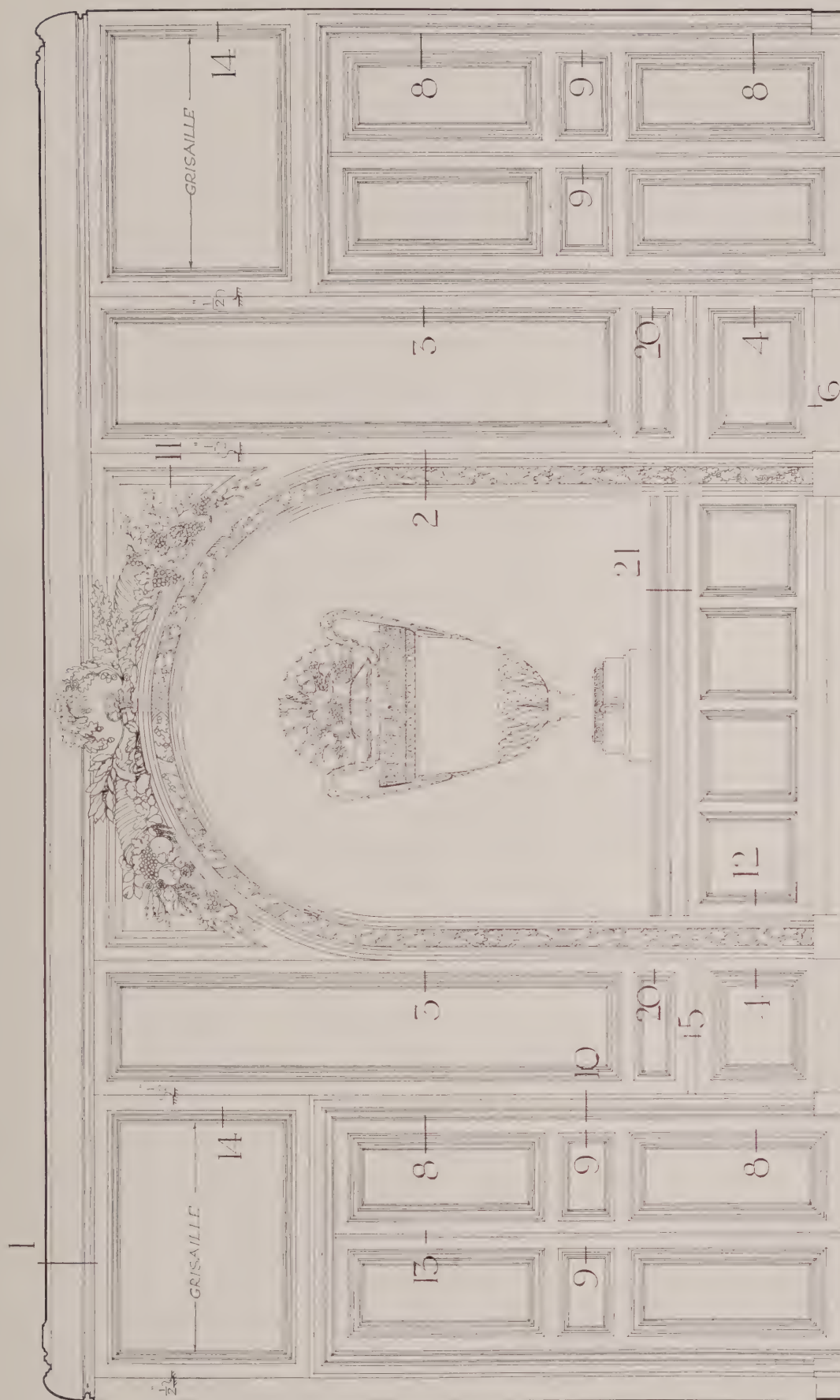
Niche Containing Decorative Porcelain Stove; Room in Hotel Gouffier de Thoix, Paris



ELEVATION C~C HOTEL GOUFFIER DE THOIN

PARIS

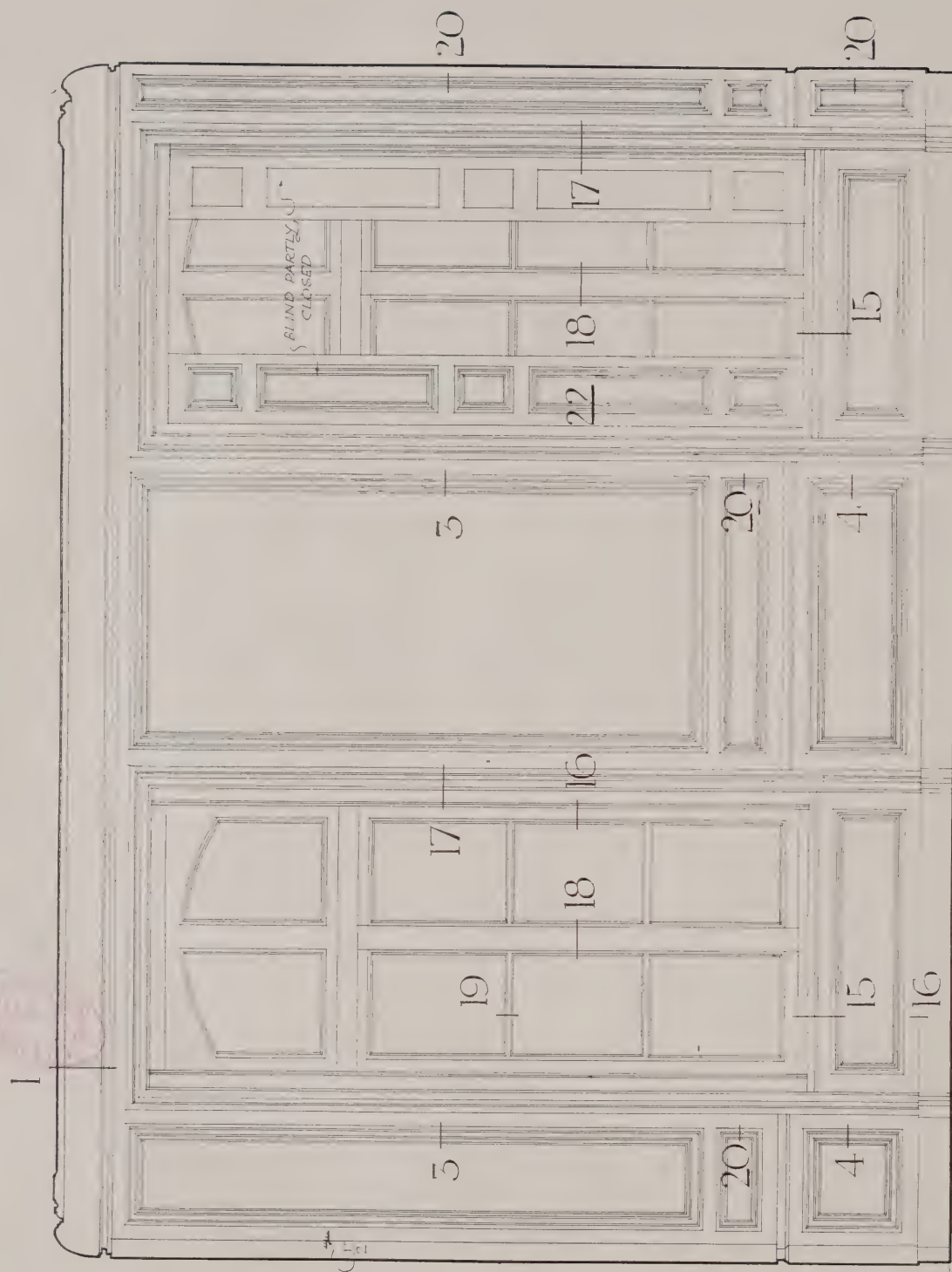
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ELEVATION A~A
HOTEL GOUFFIER DE THOIX
PARIS

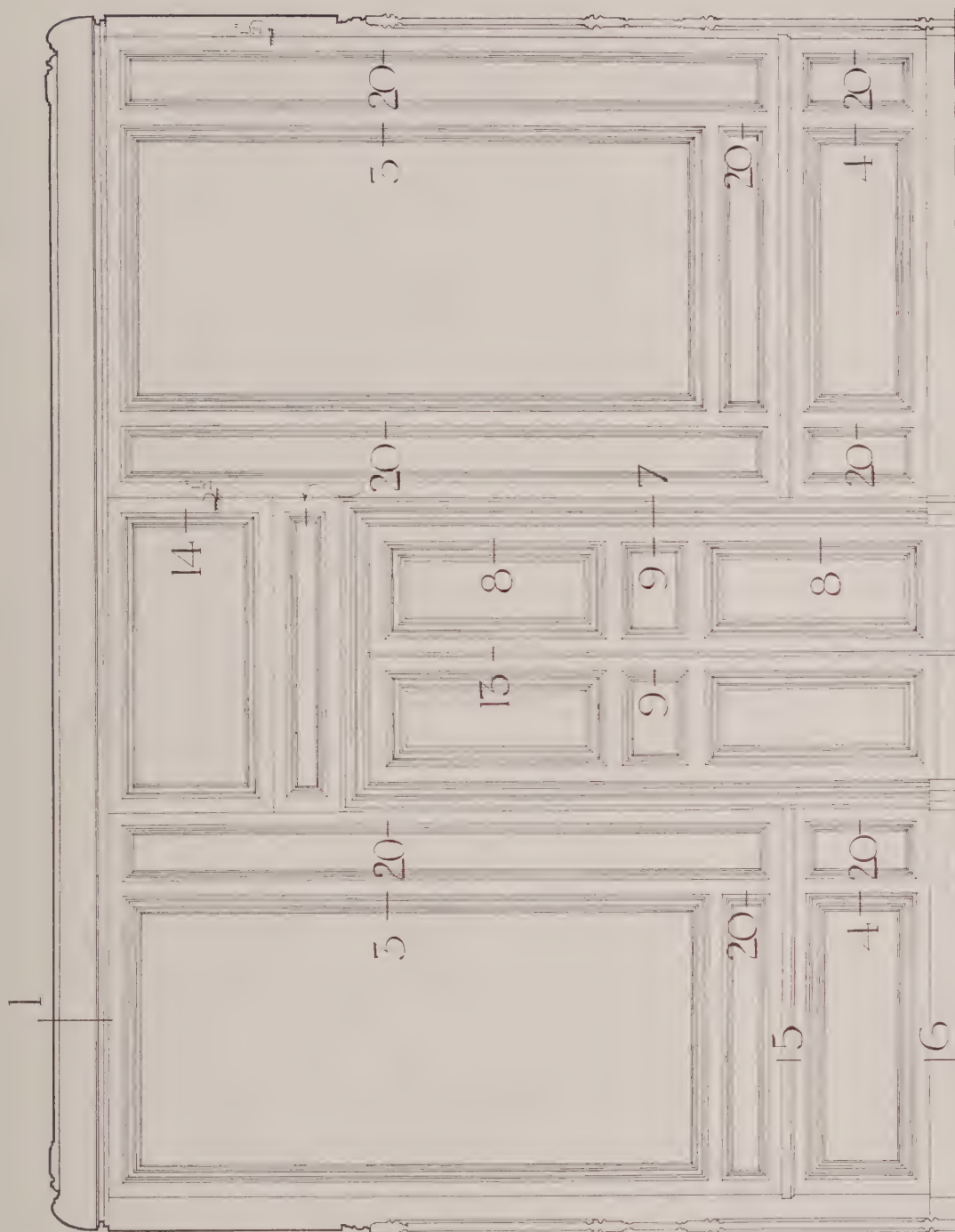
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ELEVATION D~D
HOTEL GOUFFIER DE THOIX
PARIS

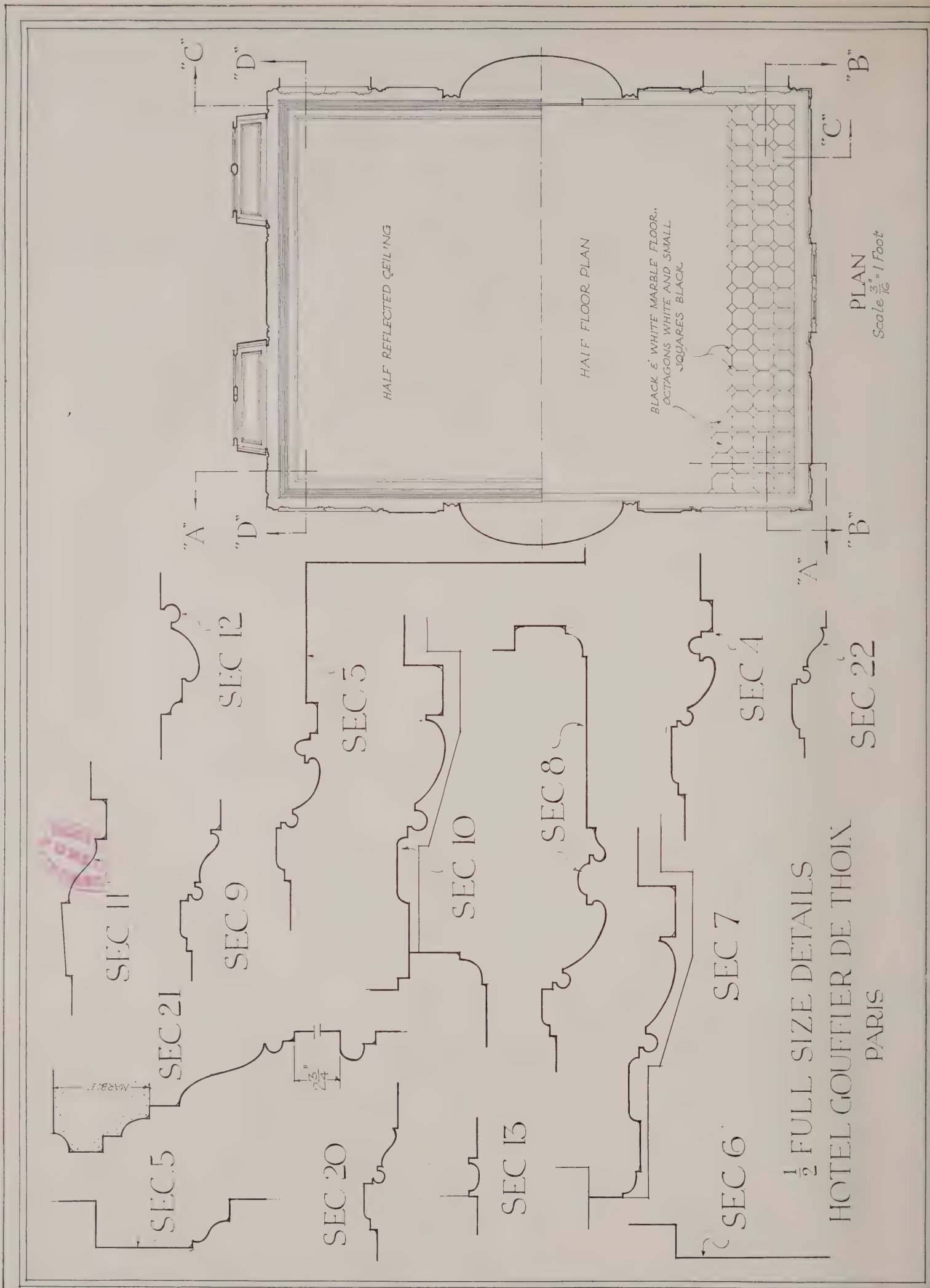
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ELEVATION B~B
HOTEL GOUFFIER DE THOIX
PARIS

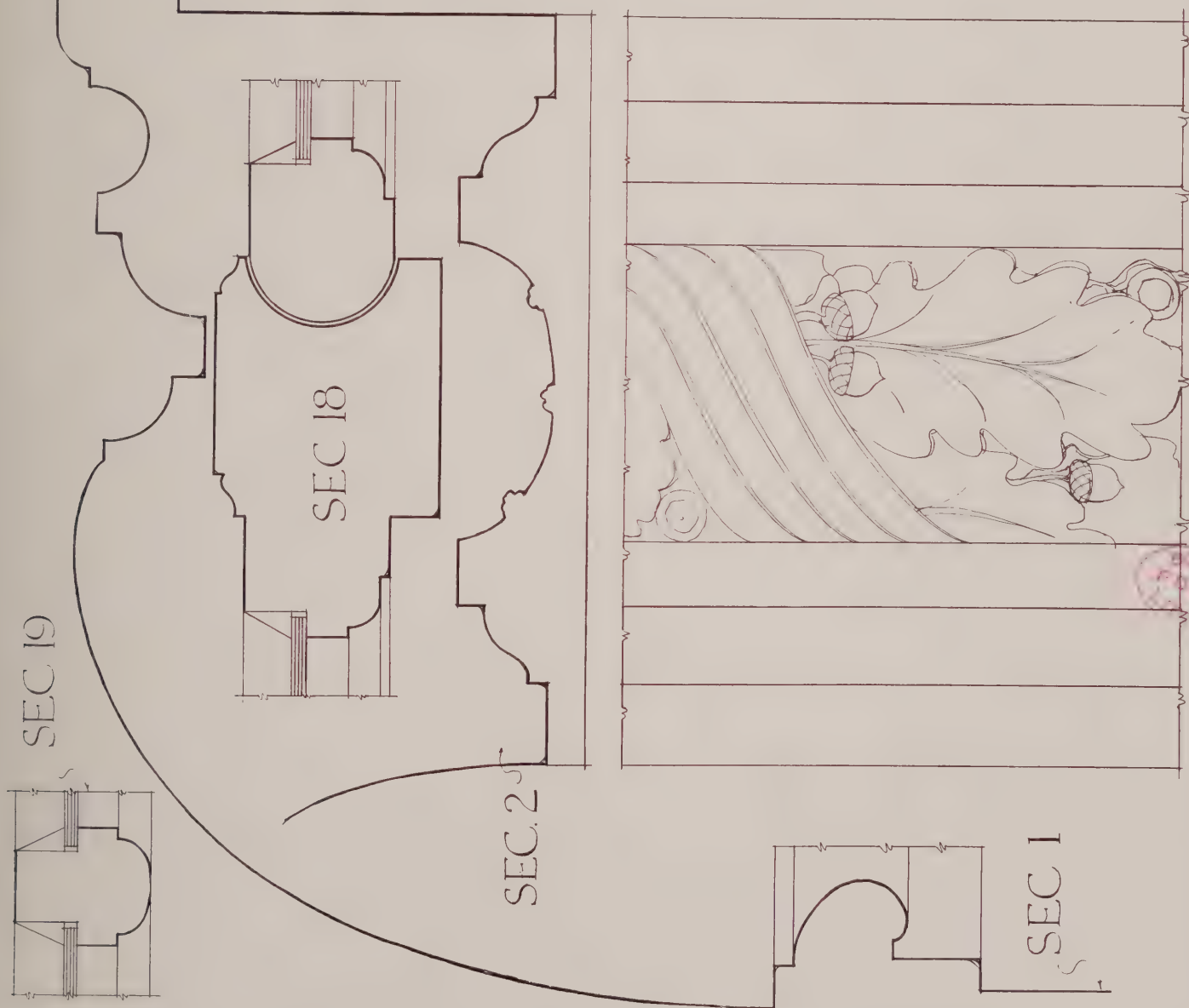
Scale $\frac{3}{8}$ " = 1 Foot

BOSTON
PUBLIC
LIBRARY



1/2 FULL SIZE DETAILS
HOTEL GOUFFIER DE THOIN
PARIS

PLAN
Scale 3/16" = 1 Foot



SEC 19

SEC 18

SEC. 2

SEC 1

SEC 14

SEC 15

SEC 16

SEC 17

SEC 1

FACE OF STOOL

$\frac{1}{2}$ FULL SIZE DETAILS
HOTEL GOUFFIER DE THOIX
PARIS



THE ARCHITECTS' FORUM



A PLEA FOR CONSTRUCTIVE MODERNISM

WE still have with us many horrors of our past,—that epidemic of Victorian Gothic and Queen Anne, done both in imitation stone and in wood; Mansard attempts; then heavy, brutal Romanesque; cast iron monstrosities, etc. Now comes the question: Are we entering upon another period that will be looked at askance 20 years from now? Always we of the present think we are different from those of the past. It is like "The king can do no wrong." It is always the past generation that made the mistakes. Therefore, no one is popular who questions the motives of the present. Men are now coming forward willing to throw away all of the good accomplished since early colonial days, each believing himself above making the mistakes of the past, and able to accomplish stylistic originality without considering precedent. I do not believe that we have to copy religiously the Classical or Renaissance styles, but I do claim that we cannot, as some modernists are trying to do, throw away all teachings of the past. Although we should not be mere copyists, we can still consider the past, even if we are at the threshold of the development of a distinctly American architecture, an event which we all desire to happen if possible in our own lifetimes. At the same time, we do not want to look back years from now and consider the work of the 1930 era as just another attempt, such as was the *Art Nouveau* of France of 1900. They thought, as we do today, that they were progressing. Now even they can look back and must admit that they did not create a lasting style.

We have begun to study the commercial and domestic phases of our problems, and have in many cases developed a style practical and expressive for our factories and warehouses, for our large office structures, and for our newer public buildings. In these buildings to which I refer all precedent has not been thrown away but adapted to modern conditions. It is true that in the past the Romanesque style was used in types of structures for which it was fitted, especially before the age of steel construction, when the combination of massive walls and details provided dark interiors. The same objections apply to buildings screened by deep classical colonnades with slit-like windows between the columns, which create deep shaded reveals and make impossible working space within. This does not mean, however, that we are not to use these styles. Any problem must be analyzed and studied to obtain satisfactory results. As an example to illustrate the point, take Richardson's Pittsburgh City Hall, considered a great example of modern architecture when it was built, and then the new New York Academy of Medicine by York & Sawyer. This latter is not just a stylistic

crib but a building designed with understanding and feeling for both its function and appearance. The motifs of both were derived from the same source, yet the newer example is both practical and attractive, while the older is not.

We have other notable examples of a modern handling of architectural design that are original in conception and yet not freakish through the use of cubist methods. It does not seem necessary to go through in architecture what Europe, and even we, experienced for a time in painting and sculpture. Our architecture has progressed further than any of our other arts, and it is conceded by foreign critics to lead the world today. We all want to feel that we will continue to lead, and in some recent work our architects have shown an able handling of new problems. We are, however, greatly indebted to the past, and that does not mean only as copyists. It would be ridiculous to agree with certain radicals who have unfortunately carried out large commissions recently, that McKim or White did not add to our artistic wealth and progress. When one criticizes, one must consider the work of the greatest and most noted of our architects and what they designed and accomplished through a free and intelligent adaptation of precedent. The *Chicago Tribune* building is modern and new, an able handling of the problem, yet based on precedent, while some of the buildings of nearly the same size in the New York midtown section are equally modern and new as to mass and color but are failures as far as exemplifying the principles of good design. There seem to be two classes of modernists who have in common only one trait,—their anxiety to get on the band wagon. The able, thinking men are striving to express modern ideas in a manner that will live, while those of the radical element are thinking only of cleverness in arranging mass, form and materials, forgetting everything else in their struggle for effect. This is the group which feels that the past is endeavoring to shackle the present. Instead, it is only showing and paving the way for greater achievement and progress. It has been a gradual up-building through centuries, first in one country and then in another, keeping alight and carrying on the lamp of architecture, until it now seems as though we have reached the greatest opportunity of all time. According to some, we ought to go back to the kindergarten and start over, instead of continuing our education. But I for one hope that we are on the road to discovering a distinctive American architecture, that our approach will be gentlemanly, and that American genius will evolve a style of scholarly and lasting merit instead of one based on transient and transparent cleverness. *Dwight James Baum*

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BOOK DEPARTMENT

THE MECHANICS OF MATERIALS

A Review by
C. W. SPENCER

THE great strides which have recently been made by the building industry in this and other countries are due in a very large degree to the methods which are now used in working out the various problems of construction. The buildings of ancient and mediæval eras, marvelous as they were, and even those of comparatively recent times, had very little background of scientific knowledge but were developed along empirical lines,—that is the methods of their builders were based on experience and traditions handed down to them and on precedent found in the work of countless generations of their predecessors. When new departures were made at all, they were undertaken very slowly and cautiously, and new methods or principles were introduced, in most cases, as the results of development through long periods of time. The modern builder, of course, derives immeasurable benefit and inspiration from study of the precedents and recorded experience of all the builders of the past; but he has, in addition to this, the advantage of being able to work out his problems in the rational or scientific manner, using the rational sciences, physics and mathematics, and then checking and testing the results so obtained in the many laboratories and proving

grounds maintained for that purpose. He is also able to profit in a great degree from the study, investigation and experience of his fellows, the results of which are now freely circulated by means of innumerable publications, both periodical and standard, in the form of articles and tabulated data covering all phases of construction science.

The successful solution of a problem in construction is had by selecting and combining materials in such a way that the completed structure serves its purpose with the greatest possible efficiency, while more labor and material have not been expended than is absolutely necessary. A simple illustration of the possibility of saving material and labor by a careful study of design from a scientific viewpoint, can be had by comparing the modern practice of constructing frame buildings with a framework of light timbers, usually about 2 inches in thickness, so assembled as to serve all necessary purposes, with the method formerly used whereby the framework was built of massive timbers, usually requiring a "raising bee" to erect them, while at the bearing points they were cut down to comparatively slight tenons, so that a beam 12x12 inches had only the same bearing power as one

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Acoustics of Buildings

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By

F. R. WATSON

Professor of Experimental Physics, University of Illinois

¶ This book covers the entire subject of Acoustics of Buildings. It describes briefly the action of sound in buildings, and, in accordance with the present knowledge of the subject, gives detailed illustrations for guidance in the acoustic design of new buildings and in the correction of acoustic defects. ¶ In this volume, mathematical formulæ and theory have been minimized, but the results of experimental tests are set forth in considerable detail. Formulæ which are needed for calculating acoustic effects are illustrated by numerical examples and curves. ¶ The publication of this book was made necessary because of the repeated requests made by architects and builders for help in the correction of acoustic difficulties found in many buildings. Information is also needed about the construction necessary to avoid these defects in new buildings. ¶ As the scientific publications on the subject deal with special topics in more or less general terms, an extensive study is required before practical applications can be made with any degree of confidence. ¶ The existing knowledge of the acoustics of buildings is incomplete in many respects, with the result that a number of misleading ideas have grown up to explain the phenomena. ¶ The book is divided into two main divisions, 'Acoustics of Auditoriums' and 'Soundproofing of Rooms.'

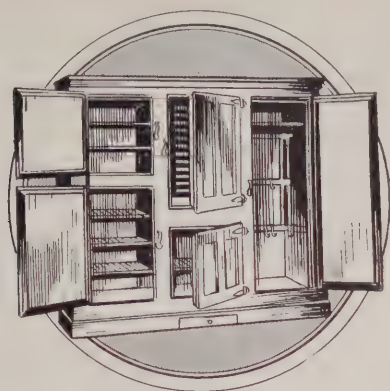
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2x12, and had in addition to support its own great weight. It is true that the buildings and their builders, as were the "raising bees," were quite picturesque, but the same effects are now obtained with a comparatively slight expenditure of labor and material. When the load which the various portions of a structure will be required to support has been ascertained by means of tables and formulæ, and when the materials have been selected with a view to availability and adaptability to the purposes of the structure, it remains only for the sizes, shapes and disposition of the members to be determined, and it is this phase of the problem in which the employment of the rational scientific method is most useful. It is the study and application of the principles governing this portion of the problem which form the greater part of the subject matter in the book "Mechanics of Materials," by George Young, Jr. and Hubert Eugene Baxter, professor and assistant professor, respectively, of architecture at Cornell University.

The methods of determining loads and the description and discussion of materials are introduced only insofar as necessary to form a basis for the working out of the main theme of the book. The computation of loads is a comparatively simple subject and in actual practice is determined largely by the use of formulæ and data resulting from experience and local conditions. On the other hand, the selecting of materials is a subject for lifelong study, due to the constantly changing sources of supply, methods of manufacture and local conditions governing their availability. There is ample material available on this subject, and a real working knowledge comes only through long experience and study. The main topic of the book consists of a study of force, motion and equilibrium, and forces and stresses including both concurrent and non-concurrent coplanar forces. A chapter is devoted to a discussion of the center of gravity and its location, and another to stress and deformation. Following a rudimentary discussion of safe loads and then a brief description of some of the more common building materials, considerable space is devoted to applying the principles and formulæ developed in the preceding chapters to the various fundamental parts of structure, such as columns and beams, and showing the deforming effects on them of stress and restraint. In the remaining five chapters, covering such subjects as "Eccentric Loads and Combined Stresses," "Combined Materials," "Unsymmetric Bending," and "Problems Involving Work," the subjects are covered in a most rudimentary manner, as it is felt that each of these topics might well be the subject of a complete book, the idea in presenting them being to arouse interest and excite curiosity rather than to offer solutions. Although a few tables and miscellaneous problems are published at the end of the volume, it has not been thought advisable to present a great extent of tabulated data, as many good handbooks are available, and it is assumed that those using this book in actual practice will supplement it with at least one good reference work. When so supplemented and used by one who has had the proper grounding in the rational sciences, it should become a valuable addition to any good architectural or engineering library.

MECHANICS OF MATERIALS. By George Young, Jr., and Hubert Eugene Baxter. 451 pp., ins. Price \$4. The Macmillan Company, New York.



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HEATING AND VENTILATION. A Handbook for Architects and Engineers. By Charles W. Brabbee. 332 pp., 6 x 9 ins. Price \$4.50. McGraw-Hill Book Company, Inc., New York.

HEATING and Ventilation," for many years the standard textbook of German-reading engineers, has been made available to American architects and engineers by its translation into English. The translator, Dr. Charles W. Brabbee, recently gave up an important position in the University of Berlin to direct research for a large American manufacturer of heating radiators.

Away back in 1893, when house heating systems as we today know them in America were in the process of evolution, Dr. Rietschel, Professor of Heating and Ventilating in the University of Berlin, Charlottenburg, sensing the need for a basic textbook on the subject, prepared his since famous "*Heizungs und Luftungstechnik*." That the architect loomed large in the field for which this treatise was written is evident from the preface of the first edition, in which we find: "I desire not only to inform owners and architects of the true setting of the problems, but also to equip the engineer with rapid means of computation for his designs." One might almost feel that the architect was foremost in the mind of Dr. Rietschel, and the engineer only an afterthought. Five years after the appearance of this first edition, cast iron sectional boilers were introduced into Europe. So the Doctor was before his time, and even at this date the basic conceptions he set forth have required only minor modifications to enable the seventh edition to rank as both fundamental and monumental. Dr. Rietschel died after having seen five editions as well as French translations testify to the intrinsic value of his life's work. His pupil and successor, Dr. Charles W. Brabbee, who also was director of the research laboratory at the university for 15 years, carried on the task of remoulding and republishing the work through two more editions. Then, about two years ago, he was called to the United States to conduct research in a laboratory especially fitted up for him by the American Radiator Company. Far-reaching and valuable were his contributions to knowledge in this field, and Dr. Brabbee has just been made director of the Institute of Thermal Research which was recently dedicated at Yonkers, N. Y.

So enthusiastic has Dr. Brabbee become over the opportunities for development in the heating and ventilation field in the United States, that he has produced an English translation, bringing to American readers this ripened fund of old-world knowledge. For the benefit of his new group of readers, Dr. Brabbee has taken logical liberties in the revision. Portions of the German text which do not apply to American practice have been abridged, and others, adaptable to conditions in the United States, have been amplified. Illustrations of American equipment have mainly replaced those of continental prototypes, but a sufficient number of illustrations of modern German boilers and equipment have been retained to make the volume valuable from a comparative point of view. The scope of the text is evident from the general heads of the four sections into which it is divided: Heating, Ventilation, The Design of Heating Systems, and Ventilation Systems.

In a general discussion of the different kinds of heating systems, Dr. Brabbee thus characterizes gravity hot-water heating: "Installations of this kind have a positive



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action which is dependable. The water temperature in the supply main is readily changed. For average winter conditions the heating surfaces have maximum temperatures of about 150° Fahr., a temperature which is hygienically desirable. Such systems are noiseless. A disadvantage is the fact that such systems are sluggish. As a consequence, hot-water heating is unsuited to rooms which must be heated rapidly or where the demand for heat is very variable. In cases of this kind the steam system is preferable. In general, the disadvantages are compensated for by the many advantages." Dr. Brabbee then proceeds to analyze the factors that must be considered by the architect and engineer in recommending or designing hot-water heating systems for residences. Descriptions and illustrations of equipment produced by leading manufacturers in Europe and America give the reader a vivid picture of what's what in this form of heating. One suggestion, applicable where gas is available, is for a duplex heating plant consisting of a small gas-fired boiler for the fall and spring heating loads and a larger boiler to be fired with coke during the severe months. Where coke is used, it is suggested that it be purchased by volume rather than by weight (one gathers that the fuel retailers in Germany are less hard boiled than in the United States!) because of the relatively high moisture-absorbing character of this fuel. He also suggests a coke bunker above the boiler installation in order that the fuel can be delivered to the boiler in a dry state. Chimneys are discussed, with the injunction that architectural features must be subordinated.

Application of some form of motive force to the water circulating in a heating system enables large, horizontally-disposed buildings and groups of buildings to be heated with ease and certainty, and the possibilities of extension of this practice to even small-house heating is outlined. High-pressure steam heating is accorded comprehensive treatment, for, although admittedly unsuited to residence work, certain applications are admirably suited to this medium. Preparatory to discussing the use of low-pressure steam for general heating, Dr. Brabbee says: "For hygienic reasons it is preferable to use hot-water heating in homes. On the other hand, low pressure steam is to be considered whenever rapid heating or speedy cooling off is desirable. As a result, it is desirable for theaters, assembly and amusement halls, business offices, churches, lecture auditoriums, for schools under certain conditions, and for the operation of steam-heating systems." Boiler types for steam-heating piping layouts are discussed and analyzed, and methods of automatic control are described. Vacuum heating, used only in connection with steam power plants in Germany, has been highly developed for residence heating in the United States, and it offers many advantages. Combination systems, where both steam and hot water are used as media, find use in specialized applications,—hospitals, some tall buildings, and hotels. Warm-air furnace heating is briefly treated, and its merits and disadvantages enumerated. It is recommended that no register temperature above 150° Fahr. be permitted. Combination steam and hot-water air heating systems, commonly known as "unit heaters," are especially adapted to large single rooms, theaters and auditoriums, and are arranged for recirculation or for delivering fresh air, or for any com-

bination of the two. The use of steam and water as heating media in district heating systems is outlined, the former being preferred in the United States and the latter in Germany, where forced circulation is practiced. The first heating system of this type was installed in New York in 1879, and today it has, in its downtown plant, 45,000 boiler horsepower.

Utilizing the exhaust steam from engines or turbines for heating purposes has reached a high stage of development, particularly in large industrial plants where both power and heat are required for many purposes. Dr. Brabbee presents graphic charts giving heat balances for various prime movers, showing that, as an average, 60 per cent of the heat energy in fuel cannot be converted into power, and would be wasted if it were not possible to use it for heating purposes. He outlines the elementary economics of the problem and discusses, in considerable detail, the technique of exhaust steam heating. "Ventilation is necessary," says Dr. Brabbee, "because of the contamination of air in occupied rooms. The degree of the possible contamination of the air supply may be appreciated when it is considered that people assimilate 25 pounds of nourishment in a gaseous form and 6 pounds in the form of solids and liquids in 24 hours." Calling attention to the fact that the ventilation of schools in Europe is not given sufficiently serious attention, Dr. Brabbee maintains that adequate ventilation in such quarters not only reduces sickness but minimizes the effort required of a teacher, and increases student capacity.

Many fundamental data are given on the subject of heat-and-moisture emission from persons and from sources of illumination, leading up to the question of the required changes of air for any given conditions. The synthetic air chart, resulting from the very extensive investigation of the American Society of Heating and Ventilating Engineers, is cited as the foundation of air conditioning knowledge. The essentials are proper temperature, humidity and air motion, with minimum dustiness, odor, bacteriological content, and carbon dioxide content. Each of these is discussed and analyzed. A section is devoted to a study of pressure relations in a closed room, followed by outlines of various non-mechanical and mechanical means of room ventilation. In this chapter is a fund of information on equipment for dust removal, humidifying, moving air and controlling air conditioning. Outlining methods of cooling occupied rooms, Dr. Brabbee says that, in general, inside temperatures should not be maintained at more than 10° to 12° below the outside temperatures, and recommends a decrease in relative humidity and definite air movement to produce comfortable conditions. Of less interest to architects are the portions of the volume devoted to technical analysis of heating plant design, prefaced by a mathematical study of heat transmission and of heating surface computation. The designing of various types of heating systems also is handled with characteristic Teutonic tendency toward mathematics, and with scrupulous thoroughness. Several typical examples are worked out in detail, and this portion is of inestimable value to the heating engineer who cares for accurate and finished predetermination rather than for rule-of-thumb estimates. These examples cover almost every conceivable method of heating with high- and low-pressure vacuum steam, hot water and warm air.



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From the Etching by Anton Schutz

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER FOUR

APRIL 1928



PUBLIC BUILDINGS AND THE ARCHITECT

BY

SULLIVAN W. JONES

FORMER ARCHITECT OF THE STATE OF NEW YORK

THE part architecture should play and the place of the architect in public building progress are questions assuming aspects of vital interest to the architectural profession. At the sixtieth convention of the American Institute of Architects in Washington last May, while discussing these questions, I pointed out that during the next 12 years a minimum of one and one-half billion dollars would have to be spent on institutional and other public buildings by the 48 states collectively. More recent studies of the building needs, which have accumulated and are now accumulating at an increasing rate, seem to indicate a total expenditure far in excess of the previously stated minimum. This substantial increase is reflected not only by the rapidly growing needs for additional prison and mental hospital and other institutional capacity, but also by the growing importance of public works as a field for the permanent investment of the vast accumulations of capital in this country.

The profession's interest in this great program has many roots; but its immediate interest, which must be aroused and sharpened into action, is twofold:—first, as a profession, in seeing that the policy and procedure adopted by the several states are consistent with the fundamental principles underlying professional practice; and second, as well informed citizens, in seeing that conditions created insure against planning which produces abortive architecture, waste of public funds, high maintenance and operating costs, and the intrusion of purely political considerations. The interest of the architect as a citizen and tax-payer who knows how buildings should be designed and constructed, assumes the quality of a real and compelling responsibility. Very generally the profession has recognized and accepted the responsibility with which specialized knowledge automatically clothes itself. The success or failure of representative government depends largely upon the effectiveness of the well informed, articulate minority in preventing blunders and insisting that whatever is done shall be done in the interest of the public, whose money is being spent. Indeed, that purpose is at the very core of the professional idea.

This is the time, it seems to me, to design and construct the machinery,—or at least to design it,—for the wise and economical execution of this impressive public building program. The profession must not, by default, permit the designing of this machine by inept, ignorant and selfish hands. If the profession does not seize the opportunity to secure proper legislation, a situation may be expected to develop similar to that which has aroused the indignation and protest of the architects of New York. Often, things done are ridiculously difficult to undo because they get tangled with those imponderables in politics which stubbornly refuse to give way to reason, logic and common sense, but which grow out of and turn upon wholly irrelevant conflicts between personal aims and aspirations, grudges, petty prejudices and struggles for individual advantage.

In 1899, upon the insistence of Theodore Roosevelt, then governor, the state of New York stepped into the van of progress by creating the office of state architect. This happened after the capitol had been 30 years building and not completed. In 1909 the enactment of the public buildings law definitely fixed the state architect's duties, gave him authority over all buildings constructed with state funds except armories, and established supervision of architecture in connection with state buildings as a function of state government by creating the Department of Architecture. Until January 1, 1927, the state architect, like the attorney general, rendered his professional services to the legislature, the governor, and to all departments, boards and commissions to which funds were appropriated for the construction of buildings. These other state agencies were the state architect's clients, and he served them just as an architect in private practice serves his clients. The state architect's practice, however, assumed a scope and proportion far beyond ordinary practice; his planning and budgeting were for the whole state. "Where to build," was a more important question than "what to build." The planning and construction of state hospitals for the insane formed not a problem of one building or a group of buildings, but one of a coördinated state-wide service balanced

against population needs. Architecture as a function of government is, in part, regional planning, and takes on some attributes of statesmanship. Programming and budgeting the building needs of a state as a preliminary to the framing of appropriation bills are work for which the architect is peculiarly well qualified by training, experience and habit of mind.

Until reorganization became effective, the public buildings law in the state of New York clothed the state architect with authority to secure the services of architects in private practice on individual projects. This authority was used in many cases where such services were beneficial to the state, either in expediting work or by bringing to bear upon the solution of special problems specialized knowledge and experience. The law worked well. It provided for tapping the great reservoir of competent architectural service available, and at the same time centralized control in an official who was sympathetic with and understood established procedure and knew how and where to secure the services required. The high standards of design and execution and the low cost of services attest the wisdom and success of the law. But all of this has been cast into the discard to embark upon an experiment in working out a mistaken theory of organization which already has proved disastrous. The Department of Architecture has been abolished, and its duties transferred to a Division of Architecture in the Department of Public Works. The state architect has been stripped of his former responsibility and authority and subordinated to the Superintendent of Public Works. Supervision of construction has been transferred from the state architect to the head of the department's engineering division. The designer no longer controls the execution of his design. As a function of government in New York, the practice of architecture is being ignominiously dragged through the mire. And to complete its prostitution, legislation is now pending which changes the title of state architect to "Commissioner of Architecture" without requiring the appointee to be an architect!

I have drawn a somewhat detailed contrast between the past and present conditions in New York with a double purpose:—first, to indicate to the profession what may be expected to happen in other

states; and second, to show that before architecture and public building were sacrificed upon the altar of the great god "reorganization," whose feet are of political clay, the procedure was in substantial accord with the policy laid down by the Institute many years ago and reaffirmed by the regional conference held in Albany on February 28: "The public interest is served best when the official architect, federal, state or municipal, may function freely and independently in serving the departments of the government, and provision is made for the employment of competent and experienced architects in private practice in connection with the design and construction of important public buildings."

What has happened in New York may have a long trail of disastrous consequences, because of the state's pioneer work in establishing a wise and economical procedure in the construction of public buildings, and in formulating and financing its unprecedented construction program. Unless the habitual tendency to follow in the footsteps of the leader is checked, we shall have other states using New York's retrogression as full justification for standing pat or following a similar course. Let there be no mistake about it,—New York has relinquished its leadership, lowered its standard, and retreated to the dismal period when architecture in connection with public buildings was counted among the prizes in the patronage grab bag. The issue in New York has now become enmeshed with the political imponderables. New York has made itself the battleground upon which not a local but a national issue is being fought out. The New York profession is making a splendid fight, in which it has the whole-hearted and enthusiastic support of the entire building industry and the civil engineers. The support of the profession everywhere should be thrown behind the architects of New York. If they are defeated, the action will shift to other states, and the profession will be confronted with the necessity of conducting a disheartening defensive campaign. Every effort must be made to reestablish architecture in its rightful place in state work to insure that the public funds shall be expended in such a way that the buildings will be efficiently planned, properly designed and economically built.



State Office Building, Albany

Sullivan W. Jones, State Architect

THIN SLAB CONCRETE FLOORS OVER STEEL JOISTS

FLOOR CONSTRUCTION SYSTEMS EMPLOYING LIGHT STEEL STRUCTURAL MEMBERS IN CONJUNCTION WITH A CONCRETE SLAB POURED IN PLACE WITHOUT FORMS

BY

C. STANLEY TAYLOR

SEARCH for improved materials of construction and for better methods of utilizing the materials already at hand has been going on ever since man first undertook to erect shelter. Within comparatively recent years the materials employed for the structural elements in buildings have been the subject of extensive research, directed toward greater economies through the elimination of unnecessary or surplus material and through improved methods of putting the structural members together to form the desired kind of building. Wooden construction has been largely superseded for important structures by the use of steel and concrete because of their fireproof characteristics, and because their greater strength permits their use in buildings of great size.

The use of both steel and concrete for structural floor systems has developed within the lifetime of living architects and engineers. Reinforced concrete has been employed only for about 30 years. Structural steel construction has a history running back approximately a half-century. No better materials have been developed, but the method of utilizing these two basic structural materials has been undergoing constant improvement. Steel and concrete have been used together in practically all modern buildings, especially for the construction of floors. Local market conditions and the availability of materials, together with the size and height of the structure have been the governing factors determining the choice of reinforced concrete or structural steel framing for any given building. In some areas for buildings up to 10 or 12 stories in height reinforced concrete has proved to be very economical. Steel has universally predominated for taller structures, and in certain sections it is cheaper than concrete even for lower buildings. Methods heretofore employed for the use of steel and concrete for structural floor systems have been considerably more expensive than wood joist construction formerly employed, due largely to the need for formwork to support the concrete slabs during the construction process and because the dead load imposed by the resulting floor system has been relatively high.

There has recently come into general use a new system of floor construction employing a relatively thin concrete structural slab supported by light steel joists in which the need for formwork has been eliminated by the use of a reinforcing material which combines the functions of a form and slab reinforcing. In order to acquaint architects and builders with the present state of development of this system, the subject is divided under these different headings:

1. Summary of Thin Slab Concrete Floor Systems.
2. Characteristics of the new Floor System.
3. Fireproof Qualities.
4. Insurance Ratings.
5. Building Codes.
6. Types of Steel Structural Members.
7. Typical Load-bearing Capacities.
8. Methods of Installing Steel Members.
9. Slab Reinforcing and Supporting Materials.
10. Methods of Installing the Concrete Slab.
11. Ceiling Construction.
12. Specifications.

The data upon which this article is based have been obtained through engineers, architects and builders who have successfully employed this type of construction; from the manufacturers of the various materials used in the system; and with the coöperation of the American Institute of Steel Construction.

Summary of Thin Slab Concrete Floor Systems

Reduced to its simplest terms, this floor system consists of four elements: the steel joist or structural member; the material used to support and reinforce the slab; the concrete slab with its finished floor surface; and the ceiling beneath. The steel joists are light structural members of which several types are now on the market. These types include rolled steel sections having solid webs and flanges, rolled steel sections with expanded or perforated webs, and various types of built-up members usually of truss form composed of bars, tees and angles welded or riveted together in accordance with various designs. These structural members are placed upon the building framework or walls without riveting or welding and, being entirely fabricated in the shop in standard lengths, require no cutting or fitting at the site. They are held in place by means of wire or metal bridging and bracing and by various types of clips or anchors, as will be seen in several of the accompanying illustrations.

On the tops of the joists, which are usually spaced from 12 to 30 inches apart, metal lath or one of the newer types of welded mesh reinforcing, having a waterproof backing which eliminates use of forms, is spread and attached to the truss by means of clips or wedges. After conduits and pipes are in place, a concrete slab is poured directly over the supporting and reinforcing material. Where a wood top floor is contemplated screed chairs and sleepers are



Steel Joists of Average Length Are Light Enough to Be Handled by Two Men

set before the concrete slab is poured. No temporary forms are required. To the underside of the truss metal lath is wired or attached by various devices designed for the purpose and a plaster ceiling applied in the usual fashion.

Characteristics of the New Floor System

The resulting construction is considerably lighter than a reinforced concrete floor or a floor composed of structural steel shapes encased in concrete with the usual reinforced concrete slab above and between the beams. The average weight of a thin slab concrete floor on steel joists, including the metal lath and plaster ceiling, the weight of joists, the slab and wood top floor, is from 40 to 50 pounds per square foot. This floor system is primarily designed for relatively light live load capacities. For practically all spans possible with standard steel joists or trusses, live load capacities range from 40 pounds to 150 pounds per square foot. This range is obtained largely by the spacing of the steel joists. While joists are provided for any local condition, the system is generally used for light-occupancy buildings.

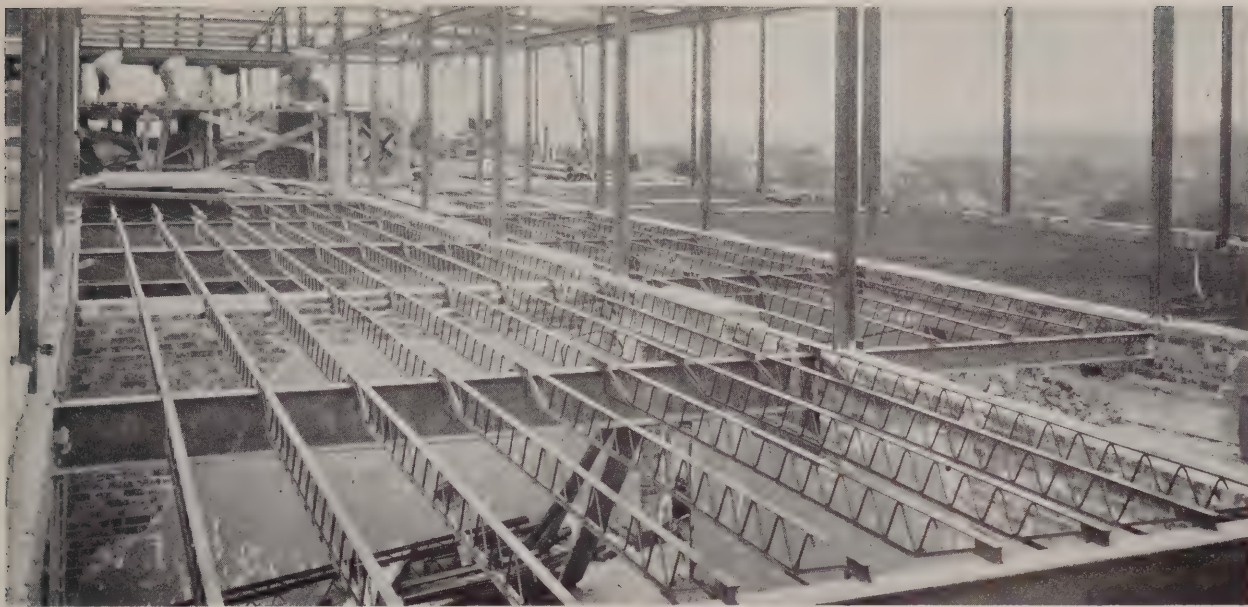
A number of important economies are inherent in this type of construction. The relatively light dead load lessens the load imposed upon columns, bearing walls and foundations, resulting in a saving in the materials required and in cost of these parts. There is an obvious saving in the amount of material employed, less steel and less concrete being required for this light-weight floor construction than are needed for other standard types of floors, and there is a very marked saving in the amount of labor needed to install these materials. The entire elimination of formwork is perhaps the most important single factor in lowering the cost of this new floor construction system. Forms are expensive to build

and to take down, and the material used in the forms has little salvage value. Formwork contributes nothing to the ultimate value of the structure.

Practically all types of steel joists permit conduits and pipes to be run through the floor between the ceiling and the concrete slab, either by carrying the pipes through the open webs, when this type of member is employed, or by carrying them around the ends of the joists when solid web members are used. This opportunity for utilizing waste space within the floor itself eliminates the need for extra slab thickness to conceal conduits and pipes, often necessary in reinforced concrete or fireproofed steel construction. The rapidity with which the floor can be constructed contributes further saving. There is no riveting or fabricating on the site. The elimination of the forms saves time as well as materials. The self-supporting floor permits other operations to be conducted on floors immediately below that under construction, and mechanical installations can be carried on while the floor is under construction. These factors shorten the time required for completing the building, resulting in lower interest charges on the capital tied up during the construction operations and advancing the date when the building begins to produce an income.

Fireproof Qualities

It is not generally realized that thin slab concrete floor construction upon steel joists enjoys the rating of "fire-resisting" construction. The steel joist type of floor has been in use for 20 years. In all this time there has never been a reported instance where fire has structurally damaged a steel joist floor. Fire tests by impartial engineers have proved this fire-resisting quality to be due to the inherent characteristics of the floor system and not to a fortunate lack



Steel Joists Are Easily Placed Without Field Fabricating or Riveting

of serious fires in buildings employing this construction. The reasons for this characteristic are of considerable interest. Many materials are incombustible at even high temperature, but no material is immune from expansion and contraction with variation in temperature. As an example of the extent of this expansion, a steel beam 20 feet long will expand about 3 inches when raised from 100° to 1600° Fahr. Concrete expands in a similar manner, the rate of expansion varying with the aggregate. When a member such as a steel beam is heated on one side while maintained at ordinary temperatures on the other side, the resulting expansion will cause distortion or buckling toward the heated side. Similarly, if the beam is rigidly fixed at its ends, and heated uniformly or otherwise, the expansion that is bound to take place results in distortion. However, a beam that is loose at one or both ends will simply expand in length without distortion, if uniformly heated. As a result, a beam resting on brick walls will successfully withstand greater temperatures than a beam riveted to columns.

Another effect of heat on building material is on its strength. In general, as the temperature rises the strength decreases slowly to a critical point, after which it drops off rapidly. Structural grade steel, however, is an outstanding exception. Its strength is actually about 15 per cent greater at from 600° to 700° Fahr., than at room temperature. With the temperature raised to nearly 1000° Fahr., a steel member will still safely carry its designed load provided the member has been permitted to expand without distortion. Analyzing this, certain obvious conclusions are drawn as to the proper methods of fireproofing structural members: First; any heat that reaches a structural section in a building should be uniformly distributed over the entire area of the section. Second; the members should be free to

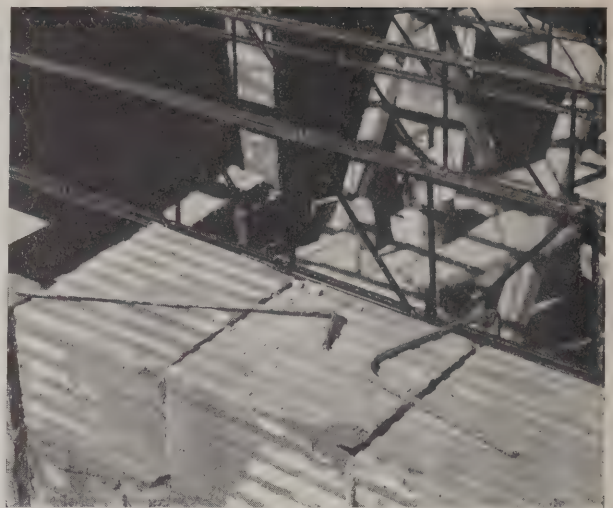
expand as heat is applied, or they should be so protected as to permit but a moderate increase in temperature.

It has also been established that fireproofing with plaster on metal lath is highly effective, probably because it employs a principle of surrounding the steel member with a dead air space. Plaster is highly resistant to the transmission of heat, but when applied on relatively smooth surfaces it has no protective value. This is because ordinarily adhesion will not withstand the stresses resulting from high temperatures. However, when applied on metal lath or other reinforcing fabric of suitable design, a mechanical bond is secured. The plaster is not only held to its work, but is reinforced in every direction against temperature stresses. The result is a tenacity or durability beyond most other combinations of materials. Many laboratory tests have been made that have consistently indicated the effectiveness of plaster as a heat resistant and have established plaster on metal lath as a fireproof detail in construction. Experience in actual fires has proved these tests.

For the reasons just indicated, steel joists as employed in this type of floor or roof construction are not fixed at their ends but are free to expand and contract with changes in temperature. The joists are surrounded by a dead air space. If the fire conditions under a floor panel are such that the temperature in this dead air space is not raised above 1000° Fahr. until the fire has burned itself out or been extinguished, the only resulting damage will be a calcined ceiling. Fire tests conducted by the Pittsburgh Testing Laboratories on an actual floor panel constructed with open web steel joists of the truss type and fully loaded, indicate that a temperature of 1800° Fahr. can be maintained for four and one-half hours under the floor without structurally damaging the joists. The floor panel used in this test had a



A Simple Method of Anchoring the Ends of Steel Joists in Masonry



Details Showing One Method of Side Anchoring Open Web Joists

metal lath and plaster ceiling beneath the joists. Both insurance rates and building codes are reflecting an ever-increasing approval of the steel joist floor as giving fire-resisting building construction.

Insurance Ratings

Insurance rates properly influence the architect's choice of structural floor systems. These rates are based on experience. When steel joists were first brought on the market in 1907, there was little to guide the insurance companies. The strip steel joist (sometimes called "metal lumber") came into prominence in 1921 when certain insurance companies recognized and granted steel joist floor construction the minimum basic fireproof rates. This rating is given steel joist floor or roof construction by practically all companies at the present when certain required conditions are met. These conditions involve properly fireproofing the structural portions of the floor. The ceiling plaster should be applied to and form a good mechanical bond with the ceiling lath. The usual practice is to use a $\frac{3}{8}$ -inch rib lath with ribs turned up or a flat diamond-mesh lath furred to the bottom cords of the joists with furring channels or rods. The joists should be placed on (not riveted or bolted to) the supports to allow the joists to expand or contract without distortion under actual fire conditions. Where wood finish floor is used, wood nailing strips should be blocked up or placed on screed clips to allow at least 1 inch of concrete to come between the wood strips and the joists. This construction takes the minimum basic fireproof rate for the slab thickness used, the same as in concrete joist floor construction. Of course it must be appreciated that this rating applies to the floor system only, and the ultimate insurance rates for any given building are influenced by other factors. The use of non-fireproof partitions or the improper fireproofing of the structural frame may penalize a building and increase its rates.

Building Codes

The architect is also largely guided in his choice of structural systems by local building code limitations. Building codes are constantly undergoing evolution and change, and no definite statement can be made with reference to the acceptance of this type of construction in all cities. In general, thin slab concrete floors on steel joists are recognized as fire-proof floor construction in all but a few of the important building centers. It must be appreciated that the method of handling approvals of new materials and construction methods by building departments varies. In most cases no mention is made of steel joist construction in printed codes. The usual recognition consists of an interpretation of existing sections of the code. In some cities only a few officials in the building department know the rules on this type of construction. Such limitation as may affect a particular building may be easily determined by writing the building commissioner, the American Institute of Steel Construction, or the larger manufacturers of steel joists, outlining the type and location of the building under consideration.

Cities such as Pittsburgh, Cleveland, Rochester, Cincinnati and St. Louis approve this construction for all types of buildings in all fire zones. Philadelphia approves the construction for all types of buildings in all fire zones under existing sections of the code that call for protection of the bottom chords of the joist with 2 inches of concrete or gypsum. The method employed for taking care of this special requirement is discussed later under "Ceiling Construction." The building departments of Washington, Detroit and Buffalo have given their approval of steel joists for all types of buildings within a specified height limitation that confines the use of this floor system to seven- or eight-story buildings. This measure of caution seems unwarranted to many familiar with the performance of these floors. It is obvious that the merit of this construction is not



Most Open Web Type Joists Use a Ceiling Bracket to Extend Lower Chord to Wall for Ceiling Lath



End Anchorage of Steel Joists on Structural Steel Girders by Means of a U-Shaped Wedge

different in the fourth floor from what it is in the thirtieth floor of a building. New York, Chicago and Boston are the large cities that do not at present permit the use of steel joist construction for fireproof buildings in the more rigidly restricted building zones. With the architectural departments of such states as New York, New Jersey and Illinois specifying thin slab concrete floors on steel joists on state projects involving millions of dollars, and with a 35-story building under construction in Pittsburgh employing this floor system, it is only a matter of time until departments will give further recognition to the merits of this system where limitations now exist.

Types of Steel Structural Members

In this article the term "steel joists" is used in a general sense to connote all forms of light steel structural members employed in thin slab concrete floor construction. Steel joists are sold under various names and are sometimes classified as rolled sections, metal lumber (pressed sections), bar joists and trusses. For our purpose here, however, the only general division of these members is into two classes,—those having solid webs similar to ordinary I-beams, and those having open webs more or less resembling inverted bridge trusses. Typical steel joists of these several types are shown in the accompanying pages by means of illustrations from photographs. The reader is referred to these illustrations for a general comparison of the characteristic features of the several types. In later paragraphs there is given a brief summary of the design features of the more important types, but no attempt is made in this article to distinguish between the merits of the various designs. Each type of steel joist has its

uses, and the designer contemplating the adoption of steel joist construction should communicate with the manufacturers of these products, obtain their design formulæ, load tables, weights and dimensions. Accompanying this article will be found a typical load table showing the safe loads for various spans and spacings, from one manufacturer's load tables, which has been greatly condensed.

Solid Web Members

This type of steel joist is manufactured in various ways. The simplest to describe is a light-weight rolled section similar in shape to a standard I-beam. These joists may be used as structural steel members riveted to the steel framework, and when so used are not properly classified as steel joists but should be considered as a special type of structural steel framing. They are also manufactured with mitered ends with bearing plates welded or riveted below the top flanges. These members rest on bearing walls or structural framework without riveting and are treated like other types of steel joists. The mitered ends provide transverse pipe spaces and also eliminate metal not required for strength. Another type of solid web section is sometimes called the "five-member" section and resembles a welded plate girder. It is composed of a web made of strip steel with four angles welded to the upper and lower edges forming flanges similar in shape to an ordinary I-beam. These also have end supports welded or riveted below the top flanges and may be mitered or straight at the ends. Metal lumber is manufactured in various ways, generally using cold rolled or pressed strip steel in channel form, or in I-beam form made by welding or riveting angles to the back of a channel.



Cross Bridging of Open Web Joists

The latter type of construction is sometimes referred to as a three-member section.

Open Web Steel Joists

This type of joist is characterized by its truss design which leaves open spaces within the webs. For our purpose these steel joists may be classified into two subdivisions, those having round top chords, usually composed of two bars separated by the web members, and those having solid top flanges. This distinction is of value, inasmuch as the method of attaching metal lath or other types of slab or reinforcing is necessarily different for these two types of joists. Steel joists with round top chords are variously called bar joists or trusses, and are built up of steel bars of structural grade steel with the web members usually arc-welded to the upper and lower chords. The lower chords are usually brought up at an angle near the ends of the joists to be joined to bearing members to which the top chords are also attached. The principal difference between various makes of these so-called bar joists or trusses lies in the design and spacing of the web struts and braces. The end bearings are usually made of I- or T-sections.

Open-web steel joists with solid top flanges are manufactured in several ways. One type employs a special rolled T-section for the chords with webs composed of bent rods in truss form which are welded at the bends to the edge of the stem of the T-sections. Another type employs a special section for the top chord and an L-section for the bottom chord and light angles to form the truss web. A third type is made of a standard rolled I-beam, the web of which is slotted, and then the beam is spread after heating, to expand the web. The resulting member has the appearance of a lattice truss but is actually composed of a single piece of metal except for an inserted center strut and special members which may be used to form end bearings. A feature often stressed by the manufacturers of open web steel joists is the opportunity for carrying pipes and conduits across a floor span through the webs. This feature is often of considerable value, although for long runs it is frequently necessary to utilize the space beneath the mitered ends of the joists either

of the open-web or solid-web type because of the difficulty of setting in place long pieces of pipe after the joists have been spaced and bridged. Most of the manufacturers of solid-web joists will perforate the webs where required to accommodate conduits or small pipes. If the designer specifies or so arranges piping as to require the contractor to carry it through the open webs of the truss type joist, the builder should be permitted to get the longer pieces of pipe in place before the joists are firmly anchored and bridged. Cast iron soil lines, of course, may be erected at any time, because the short lengths employed can readily be handled, even when relatively limited joist space is available.

Methods of Installing Steel Structural Members

This sequence of operation is generally employed for all types of steel joists. Manufacturers usually ship the joists with tags indicating their length and type, and sometimes they are specially labeled in accordance with the builders' construction schedule. Unless the building is ready for placing the joists, they are stacked on the ground, preferably on racks which support the ends, permitting the joists to hang in place on the racks without resting one upon the other. If piled on the ground and laid flat, the longer members are subject to some injury due to bending, although they can always be straightened afterwards without difficulty. When the work is ready for placing the joists, they are hoisted to the proper floors and immediately laid in the floor panels with the ends resting on the proper supports. All except the very long members can usually be handled and distributed to the correct spacing by sliding them along to supporting members. The spacing is usually accomplished by means of a wooden block or other template, and is very rapidly accomplished. At this stage a few planks may be laid over the joists as a temporary walking surface while the subsequent operations are being performed. No heavy loads should be wheeled over or carried on this planking until after the joists are anchored and braced.

Anchoring Joists

When the joists rest on masonry walls, it is customary to anchor the ends of every third or fourth joist by means of rods or ties provided by the joist manufacturer for the purpose. The accompanying illustrations indicate several methods for end anchoring. Joists which are parallel to masonry walls should be side-anchored to the walls at intervals corresponding to the specified interval for bridging. The usual anchorage is a bent rod which is embedded in the brick or tile work. With reinforced concrete construction it is customary to provide wire ties carried through the framework, the ends of which are subsequently wrapped around the first parallel joist.

When steel joists rest on structural steel framework, the ends are usually clipped to the upper

flanges of the steel girders by means of C-shaped clips driven over the flanges and the corresponding flange of the end support of the joist. Another method is to use a bent bar hooked into the web of the joist or into the end support and bent over the farther flange of the steel girder.

When the joists are used in conjunction with reinforced concrete beams, they may be set on the upper edges of the forms and bent rod anchors carried down into the spaces to be filled with concrete. If the reinforced concrete beam is cast before the joists are set in place, simple wire or bent rod anchors may be used similar to those employed over steel girders.

It should be noted that these anchors are not required on all joists, and in no case are they so rigid as to prevent the expansion and contraction of the joists under temperature changes. They simply serve to keep the joists from moving during the construction process, the weight of the finished floor being sufficient to assure their remaining in position after the floor has been completed. Anchorage is very important, however, for the end joists parallel to beams or girders when a reinforcing fabric of the welded mesh type with waterproof backing is employed for the construction of the top slab, as this type of fabric is usually stretched by a mechanical device which has sufficient power to misplace the end joists unless they are firmly anchored.

Bracing and Bridging

The next operation is to run bridging at intervals of not greater than 8 feet across the joists to prevent their movement during the operation of laying the floor slab. The bridging performs no structural function and is not designed to transmit loads from one joist to adjoining joists. Several types of bridging are employed as shown in accompanying illustrations. Some manufacturers provide special forms of metal bridging which are merely clipped or bent in place, but the usual method is to use annealed or stranded wire in one of three ways.

Cross bridging employs two strands of wire wrapped around solid web joists or around the upper or lower chords of open web joists and crossed diagonally between each pair of members. Where the wires meet, a rod is inserted, and they are twisted taut rigidly, holding the joists in place.

Two-wire straight line bridging consists of parallel wires carried above and below the upper and lower chords of open web joists, each pair of wires being twisted at two points between and across to the adjoining joists to take up the slack and form a rigid tie. This system requires four lines of wire instead of two. Single-wire straight line bridging, also used on open web joists, employs a wire for the upper chord and another wire for the lower chord, which is carried through the webs and wrapped once around each chord running horizontally to the next joist, where the operation is repeated. No twisting is employed, hence the operation must be carefully



Parallel Bridging by Means of Taut Wires

performed to be sure that the wires are entirely taut.

Attaching Ceiling Brackets

Most types of open-web joists have lower chords which slope up to meet the bearing plates leaving a gap between the horizontal ceiling line of the center part of the joist and the side wall. When metal lath ceilings are to be hung to the joists, this gap must be bridged to permit the firm attachment of the metal lath close to the wall. For this purpose joist manufacturers make various types of ceiling brackets, most of which are of such design that they may be put in place without the use of tools. They function to extend the horizontal line of the lower chords of the joists to the wall line. They bridge the spaces frequently employed for concealing pipes.

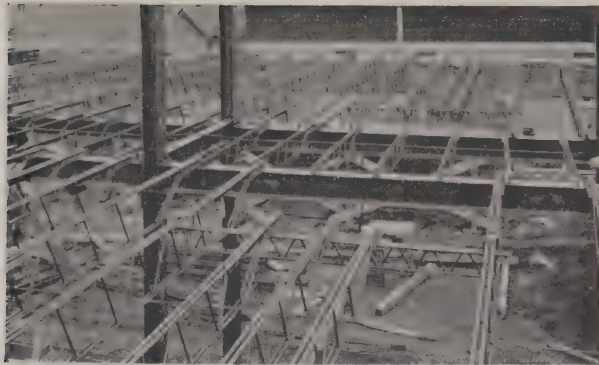
Installing Headers

Most joist manufacturers provide headers for use in framing around small openings. These headers are usually angles of small channels which are attached to the trimmer joists by means of hangers at any desired points, the bearing faces of the headers being dropped below the floor line a sufficient distance to bring the shorter intermediate joists to the level of the others.

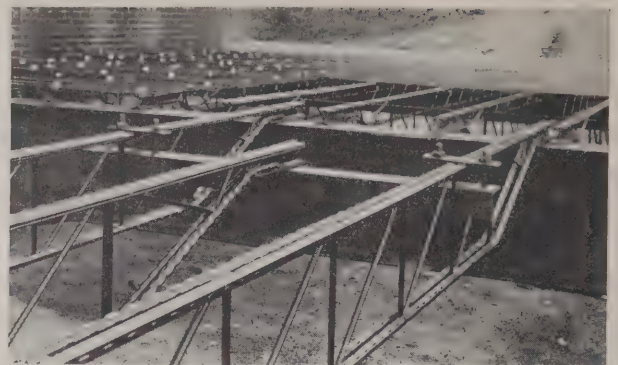
Headers may be employed with single trimmer joists for small openings generally not exceeding 5 feet in length, and with double trimmer joists for larger openings up to 8 feet. Larger openings should be framed with structural steel members.

Installing Pipes and Conduits

Mention has been made of the facility with which pipes and conduits can be concealed between the floor and ceiling with steel joist construction. With the solid-web type of joist, longitudinal lines of pipe are carried between joists, and transverse lines are carried close to the wall in the triangular spaces left under the mitered ends of the joists. Some of the manufacturers of solid-web joists will perforate the members at designated points for the insertion of flexible electrical conduit or small pipes. The open-



Small Open Web Joist Used as Header Beam



Steel Angle Header Beam Bolted to Joists

web type of joist permits the installation of transverse as well as longitudinal lines of piping at practically any point in the floor section. It must be remembered, of course, that long pieces of rigid pipe cannot be inserted through the webs after the joists are firmly fixed in place unless there is an open section at some point large enough to permit the lengthy pipe to be lifted and slid in the desired space. Contractors who neglect to take this matter into consideration are often disappointed in their ability to utilize the web spaces for pipe lines, and thus frequent criticism is heard on this point. By having the mechanical trades carrying on their work while the floor joists are being set, this difficulty can be entirely obviated.

Cast iron soil lines can usually be placed at any point because of the short lengths of pipe employed. Surprisingly large pipe lines of this type can be entirely concealed within the floors. One caution is of the utmost importance. Under no circumstances should any of the web members of the truss type steel joist be cut or bent to permit placing of pipes or for any other purpose. Another caution to note is that the weight of the horizontal lines of piping carried through the steel joist floor must be taken into consideration in designing the load-bearing capacity of the floor section. An installation was recently discovered where a very large water main was carried transversely through the webs of truss type joists along the center line of the floor span for which no provision had been made in the design of the floor. The pipe was run as an after-thought and imposed a dead load which materially reduced the margin of safety and threatened a failure of the floor.

While it is desirable to plan the installation of long runs of pipe while the joists are being installed, it is possible to carry on most of the mechanical installations after the floor slabs have been completed. This permits the contractor to place his joists, pour the slabs and enclose his building without delays and interruptions on the part of the electrical and plumbing trades. This reduces the time required to complete the building, effects a saving in the material and labor required by the mechanical trades, and facilitates winter construction work.

Slab Reinforcing and Supporting Materials

At the present state of development of thin slab concrete floors, only two types of material are employed for the support and reinforcing of the concrete. Metal lath has been the usual material. Recently a new type of welded mesh reinforcing with a waterproof backing has been introduced for this purpose and it has already proved to be excellent.

Metal Lath

Ever since the introduction of metal lumber and the earlier types of steel joists, metal lath has been used for reinforcing and supporting the slab. In theory the metal lath functions as a reinforcing material, and it is for this reason primarily that rib lath is invariably employed. The ribs are deeply embedded in the concrete slab; they are solid metal and have approximately the same effect as reinforcing rods of equivalent sectional area. Some designers do not consider the perforated mesh of the lath as effective reinforcing. Others take the contrary stand. Obviously, the perforated mesh largely remains on the under side of the slab and is not wholly enclosed in the concrete, as the latter simply keys through the mesh and gets a grip on the lath without totally surrounding it.

Whatever the design theory may be, experience has developed certain standard practices. The recommended practice is to use $\frac{3}{8}$ -inch rib lath weighing not less than 4 pounds per square yard for joist spacings up to 25 inches on centers; and to employ $\frac{3}{4}$ -inch rib lathing weighing 4.5 pounds per square yard for joist spacings in excess of 25 inches and up to the permissible maximum of 30 inches to occasionally 36 inches. Some engineers and architects have employed lighter lath weighing 3.5 pounds per square yard for floors in which the joists are spaced not over 16 inches on centers, but this light lath is not normally recommended.

The highest grade lath should invariably be employed, and it should always be painted. Care should be exercised to select a lath having enough openings to effect a good key with the concrete without choosing a mesh that is so large as to permit exces-



Rolled I-Beam Section With the Web Slotted and Expanded Into a Lattice Truss



A Typical Installation of Solid Web Steel Joists Showing Method of Bridging

sive waste of cement and aggregate through the lath when the slab is poured.

Some designers utilize temperature bars in the concrete slab when metal lath is specified, which generally consist of $\frac{1}{4}$ -inch round rods on 18-inch centers. These are sometimes placed parallel to the joists resting on the ribs of the lath on the theory that the ribs take the strains in one direction and the rods take the strains at right angles to the ribs. In other cases the rods are placed at right angles to the joists and parallel to the ribs of the lath and are usually put in place while the concrete is being spread. Another practice is the use of welded mesh reinforcing laid over the ribs of the lath.

Welded Mesh Reinforcing with Waterproof Backing

Within a relatively short time there has been introduced a new type of material especially designed for the construction of thin slab concrete floors over steel joists. It consists of a welded wire mesh made of 12-gauge wire with a spacing approximately 3 inches for the longitudinal wires and 4 inches for the transverse wires. The mesh is heavily galvanized. A typical mesh of this type has a cross sectional steel area of .035 square inches per foot of fabric for the longitudinal wires and a cross sectional area of .026 square inches per foot of fabric for the transverse wires. This reinforcing is ingeniously attached by means of secondary woven wires to a heavy double waterproof backing made of two layers of a special paper stock with a waterproof membrane between the layers. The attachment of the backing to the reinforcing material is so arranged that a space of $\frac{1}{2}$ -inch is left between the two which allows the concrete to flow around and securely embed all of the reinforcing members. The backing, which functions purely as a form, is watertight to prevent any leakage of water or fine aggregate and is of ample strength to support the concrete when being placed.

This type of material usually comes in long rolls which permit it to be laid quickly over a large area, reducing wastage, since over-lapping is minimized, and giving continuity of reinforcement. Ease and rapidity of installation are also important considerations.

Installing Metal Floor Lath

The sheets of lath are unpacked from bundles and spread over the joists, the ribs being placed at right angles to the joists. The outside ribs of adjoining sheets are nested and wired to form a continuous surface. The sheets are lapped with a minimum lap of 2 inches over a joist and secured to the joist. Joists are spaced to secure a minimum lath wastage at end laps as well as for the maximum efficiency of the joists. The method of fastening the lath to the joists varies with the different types of joists as is necessary because of the variety of top-members.

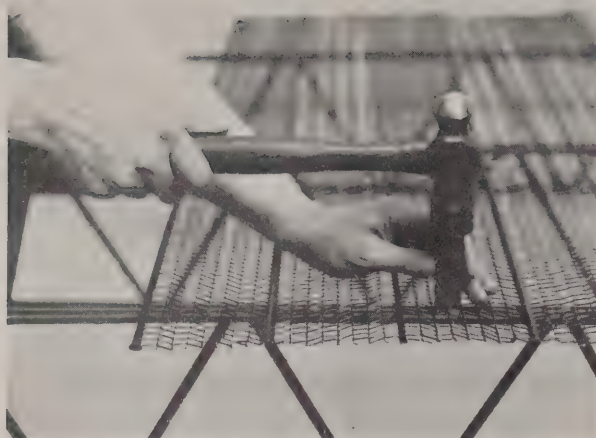
Small wooden wedges are employed with steel joists having round top chords to attach the lath to the joists. The wedges are driven through the open mesh of the lath between the top chords. With steel joists having solid top flanges, special wire clips of various types are provided by the joist manufacturers. These are inserted through the open spaces in the lath mesh and clamped around the joist flanges either with special tools or by means of ordinary pliers. Wedges or clips should be used at not greater than 8-inch intervals along each joist.

When a wooden finish floor is to be used screed chairs are attached to the metal lath or to the upper chords of the joists by clips extending through the lath and sleepers are set in these chairs at least one inch above the lath.

Pouring the Slab on Metal Lath

The concrete slab usually employed is 2 inches thick for short spacings and may run up to 3 inches for wider spacings. The latter thickness is recommended for garage floors and for buildings subject to vibration or heavier live loads. A mix of 1:2:4 is standard. Care must be exercised to keep the mix quite dry in order to minimize wastage.

The concrete is poured over the lath from barrows or dump buckets. Care should be exercised to avoid dumping heavy loads at one spot, although a well-installed lath should not be injured if the load is carefully dumped and immediately spread. The usual methods of finishing concrete slab are followed beyond this point.

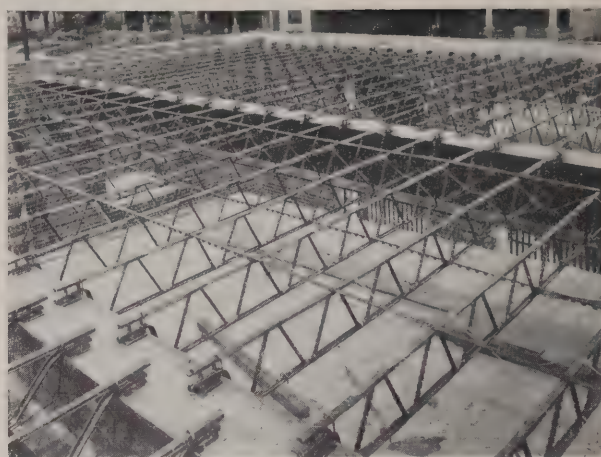


Wooden Wedges Are Used to Hold Metal Lath

Installing Welded Mesh Reinforcing with Waterproof Backing

This type of material is usually supplied in long rolls 4 feet wide. As soon as the joists are ready to receive the floor, the reinforcing fabric with its backing is rapidly unrolled across the joists (using temporary planking to support the first sheet) and the roll is cut off at the end of the span. The sheet is then picked up and turned over into place so that the backing is next to the joists and the mesh on top. One end of the sheet is then wedged or clipped to the first joist adjacent to a wall or beam. This joist and that at the opposite end of the span must be strongly braced to the supporting wall or girder as previously described. Steel joists having round top chords provide an attachment of the mesh reinforcing by the use of special metal wedges, supplied by the reinforcing manufacturer, which are driven between two chord members engaging a longitudinal wire in each wedge. An accompanying illustration clearly shows the wedge and its use. With steel joists having solid top flanges, a simple wire clip is hooked over the further flange of the joist under the mesh, and the ends are bent around a transverse wire in the fabric. Four wedges or clips are used on this first anchored joist. To the other end of the sheet of fabric a stretching device provided by the fabric manufacturers is attached by hooking it over a transverse wire, and by carrying a special lug in the stretching mechanism over the flange of the last anchored joist. To facilitate the application of this stretching mechanism, a small piece of the fabric about 6 inches wide is cut from the end of the sheet to prevent the material buckling when the stretcher is used. By means of a lever and screw the entire sheet of fabric is drawn taut, the whole operation requiring but little time.

Wedges or clips of the type just described are then attached to the anchored joist to which the stretcher is applied, four such wedges or clips being used at this end of the sheet in the same manner as they were applied to the starting end. Thereupon wedges or clips are applied to each intervening joist



Notched Spacing Bars Used With Wire Cross Bridging

down the length of the sheet, two attachments being made to each joist per width of fabric. As soon as the stretcher has been applied, this type of fabric will safely bear all ordinary loads, and workmen may walk freely over its surface to perform the wedging or clipping operations.

The adjoining sheet of fabric is then laid and stretched. Side joints should be lapped at least 2 inches; other, or end joints, at least 1 foot.

After the floor is covered screed chairs and sleepers are set in place where a wood finish floor is desired.

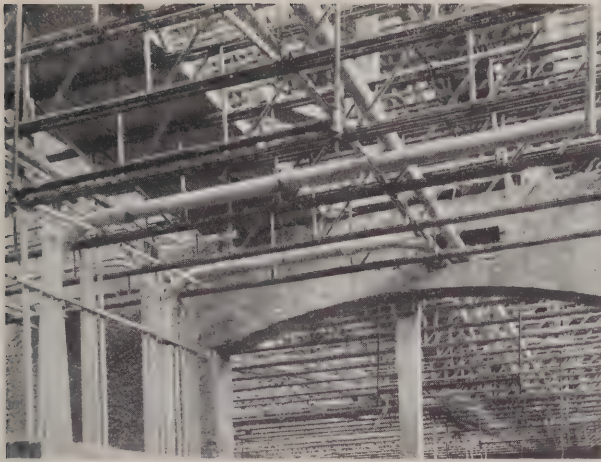
Pouring Concrete Slab Over Welded Mesh

With this type of reinforcing material the necessity for a carefully proportioned dry mix of concrete is removed, and the designer is free to specify whatever mix is desired and in accordance with any selected water-cement ratio. No material is lost through the fabric, hence there is some economy in the amount of concrete required. The waterproof backing has some insulating as well as dampproofing value and assists in the curing of the concrete by preventing its drying out too rapidly. The under side of the finished floor is clean and neat.

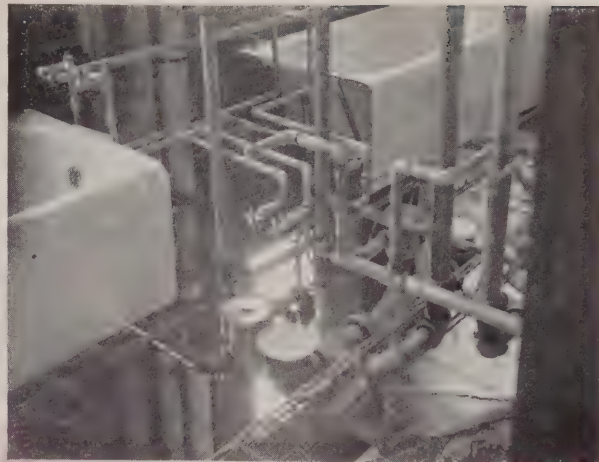
Ceiling Construction

The usual practice in the construction of ceilings under steel joist floors is to attach metal lath to the lower chords or flanges of the joists by means of wire clasps manufactured for the purpose, or by using short lengths of annealed wire carried over the lower flanges of open-web joists and twisted on the under side of the lath. Furring channels are sometimes used. The ceiling is then ready for plastering.

The building code of Philadelphia permits the use of steel joist construction in fireproof buildings providing the steel is protected by a 2-inch layer of concrete or gypsum. To meet this requirement local contractors usually hang the metal lath ceiling on light channels suspended 2 inches below the lower chords or flanges of the joists, placing the ceiling



Open Web Steel Joists Permit Placing of Pipes and Conduits Through the Webs



The Installation of Plumbing Pipes and Fixtures is Facilitated

before the floor lath or fabric is laid. Gypsum is usually employed for the fireproofing because of its lighter weight, and a layer is poured on the ceiling lath from above to the required depth, completely encasing the lower flanges of the joists. The gypsum (or concrete) penetrates the lath and forms an excellent key on the lower side.

SPECIFICATIONS

Standard specifications are published by all steel joist manufacturers and the makers of metal lath and welded mesh reinforcing material, covering the proper use of these particular products. Some are rather closely written, incorporating special features of the manufacturer's particular material; others are more general in their nature and permit competitive bidding. Where the architect feels that his client's best interests will be served by an outright specification, he should write the manufacturer's wording into his specifications. Where competitive bidding is desired, the specifications should be written with a view to placing all bids on a fair competitive basis as well as to insure proper construction.

The comments given here will supplement the information given in this article and will assist in developing a comprehensive specification.

Live Loads

The live loads should be specified for each floor or roof panel, rather than leaving this to the option of the manufacturer.

Partition Loads

Lighter partitions can be ignored or included as part of the specified live load. The weight per lineal foot of heavier partitions should be specified. Where heavier partitions are over and paralleled to the joists, good practice calls for extra joists to carry the partition load.

Floor Dead Loads

The floor dead load will vary with the floor slab thickness and type of finish floor used and can be obtained from any of the manufacturers. The steel joists themselves represent only about 10 per cent of the floor dead load, with little variation between different makes of joists. For this reason the floor dead load should be specified.

Basis of Design

If the A. I. S. C. specifications are to govern, the specifications should clearly state that, "the joists are to be designed in accordance with the American Institute of Steel Construction specifications for the specified floor loads." If other specifications are to govern, the specifications should clearly state the basis of design.

Spacing of Joists

Tie beams may or may not be used as joists. It is good practice to use a tie beam as a joist only where its deflection under full load approximates that of the joist. Joists may or may not be placed alongside of and parallel to the end walls in each panel. Good practice calls for these joists. The specifications should clearly state where tie beams are to be figured as joists and where joists are to be placed alongside of and parallel to end walls as well as the maximum center spacing of intervening joists. Under ordinary practice the maximum spacing of joists is 25 inches for floors and 32 inches for roofs. The solid web members of I-beam sections are not limited to this spacing when used as structural members, but practical experience with metal lath seems to establish these limits for best construction. Welded mesh reinforcing seems to permit wider spacings than are customary with metal lath, and 30 inches may be considered the maximum spacing for good practice with this material. In some types of buildings



Stretching Welded Mesh Reinforcing Fabric



Pouring Concrete Over Welded Reinforcing Fabric

and for certain loading conditions a closer spacing of joists should be specified. For example, good practice calls for a maximum spacing of 16 inches for garage floors.

Steel Joists

The specifications should require the manufacturer to furnish joists in accordance with his published dimensions to allow the architect or his engineer to check the correctness of the design. Where these data are not published, the architect should insist on the manufacturer furnishing complete detailed dimensions before allowing the contractor to quote on his material. This will allow the architect to intelligently compare and approve the particular makes of joists to be considered before the contract is awarded. The usual specifications that full facilities are to be provided by the manufacturer at all times for the proper inspection, chemical or physical, of the material and the workmanship used in the manufacture of the material, should be included.

Bracing

The steel joist has its center of gravity below the line of bearing and assumes its natural position when placed. The specifications should require that the end joists in every panel be anchored to the parallel wall or beam and intervening joists securely braced with bridging wire, bridging to be placed at least 8 feet on centers and drawn taut. This insures the joists holding their proper position during the erection period. The concrete floor slab and ceiling effectively brace the construction after they are in place.

Ceiling Lath

The ceiling lath and ceiling extensions are usually handled by the lather and should be specified as a part of his contract. The usual practice is to use a $\frac{3}{8}$ -inch rib lath with the rib turned up or a flat diamond mesh lath furred to the bottom chords of the joists with furring channels or rods. The lath specified should provide a good key for furnishing a mechanical bond.

TOTAL SAFE LOADING IN POUNDS PER SQUARE FOOT UNIFORMLY DISTRIBUTED

(Abstract of Table as published by one Open Web Type Joist Manufacturer)

This loading table is standard, and joists as shown in tables of dimension for both the American Institute of Steel Construction Specifications and the American Bridge Company specifications have been designed to meet these loading conditions.

(Under column headed Joist, first number gives depth in inches, second number in length of joists in feet.)

Span	Total Load	SPACING C-C OF JOISTS IN INCHES																	
		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	28	30	
4'-0"	2528	632	584	542	506	475	446	422	400	379	361	345	330	316	303	292	271	253	
6'-0"	1686	281	260	241	225	211	197	187	178	169	161	153	147	141	135	130	120	112	
8'-0"	1856	232	214	199	186	174	164	155	147	139	133	127	121	116	111	107	99	93	
10'-0"	2160	216	200	185	173	162	153	144	136	130	123	118	113	108	104	100	93	86	
12'-0"	2928	244	226	209	195	183	172	163	154	146	140	133	127	122	117	113	105	98	
14'-0"	2506	179	166	153	143	134	126	120	113	107	102	98	93	90	86	83	77	72	
16'-0"	2784	174	160	149	139	131	123	116	110	104	99	95	91	87	83	80	75	70	
18'-0"	3816	212	196	182	170	159	150	141	134	127	121	116	111	106	102	98	91	85	
20'-0"	4160	208	192	178	166	156	147	139	131	125	119	114	109	104	100	96	89	83	
22'-0"	4510	205	190	176	164	154	145	137	130	123	117	112	107	103	98	95	88	82	
24'-0"	4872	203	188	174	162	152	143	135	128	122	116	111	106	102	98	94	87	81	
26'-0"	5250	202	186	173	162	152	143	135	128	121	115	110	105	101	97	93	87	81	
28'-0"	5630	201	186	172	161	151	142	134	127	121	115	110	105	101	97	93	86	80	
30'-0"	6060	202	186	173	162	152	143	135	128	121	115	110	105	101	97	93	87	81	

INSTRUCTIONS FOR USE OF TABLES—

All loads are computed for the clear span.

Deduct width of beam flange to determine clear span.

Opposite the clear span in the first column, follow the table to the right until the proper figure for total dead and live load is reached. At the head of this column will be found the proper joist spacing.

HEATING AND VENTILATING FOR THE ARCHITECT

BY

PERRY WEST

CONSULTING HEATING AND VENTILATING ENGINEER

SOME feel that it is not necessary, in this age of highly specialized practice, for the architect to know very much about heating and ventilating. The architect finds, however, that there are a great many things which he must know about them in order to be successful in his own business. The problem is to differentiate between that which he does and does not need to know, so that he will not be burdened with any of the latter that can best be left to those who are especially trained and experienced in these particular branches of engineering.

The practice of architecture covers a broad and varied field, pertaining to art, science and business. The architect is generally the individual who pieces all of the various components of the building together, and it is he who must bring each of them into proper scale and keeping with the character, the cost and the purpose of any particular operation. In order to do this successfully he must have most accurate general knowledge about certain phases of each of these branches, but he is hardly expected to know all of the technical details, as a complete knowledge of any one is, at the present time, as much as anyone may hope to attain. Believing, therefore, that it is the part of wisdom for the architect to decide just what he should know about heating and ventilating, we shall endeavor to give an outline of the kind of information which may be considered most useful, and to name some of the reasons why and suggest some of the ways how this may be used.

Some of the Architect's Considerations

Residences. The kind of heating? Shall it be steam, hot water, warm air, gas, electric or some combination of these? If steam, shall it be one-pipe gravity, two-pipe gravity, closed or open, vapor or vacuum? If hot water, shall it be one-pipe, two-pipe, open or closed? If a warm air furnace, shall it be piped, pipeless, with or without a fan?

Office Buildings. Heating for the office or commercial type of building may be by any of the systems mentioned, and the points of particular interest to the architect are the same; but in addition he must know something about coördinating the heating and the hot water service; vacuum systems, forced circulation hot water systems, the relative merits of basement supply systems with up-feed risers, overhead supply systems with down-feed risers, balanced systems, and special automatic or manually controlled systems for meeting different outside weather conditions; divisions of systems into sections with controls for meeting the varying sunshine and wind conditions on the different sides of the building and separate systems for restaurants, assembly rooms, etc.

Hotels and Apartments. Heating in this class of buildings involves also the coördinating of the heating with the kitchen and laundry equipment, with electric or power plants, and with the refrigeration in certain instances. In hotels there is usually considerable ventilation also to be considered.

Hospitals and Institutions. In these structures there are usually added the problems of long transmission systems and summer heating for operating rooms, bathrooms, defective patients' rooms, etc.

Industrial Buildings. Heating these buildings involves the additional problems of space and light obstruction, coördination with ventilation and air conditioning and with the processes of manufacture.

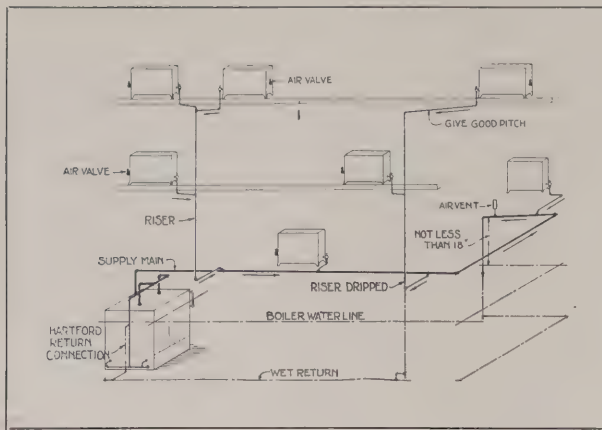
The Kind of Heating Apparatus

The kind of boiler to be used must be decided. Shall it be coal-, oil- or gas-fired? The kind of radiation must be chosen, whether the column type set on the floor; legless type hung on the walls; concealed in recesses or covered by cabinets; wall type; one of the newer types of concealed or cabinet radiators; or some of the latest tubular or radiant types. The problems of choice are often puzzling to the architect. Many are dependent on the owner's preference and on the proper relation of the heating system to the design and to the cost of the structure.

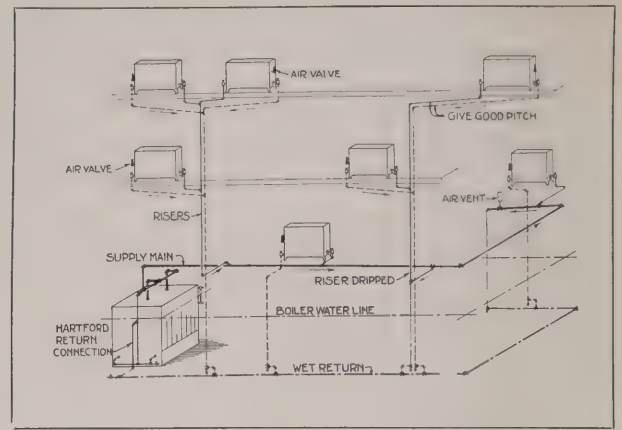
Ventilation. The architect desires to know under what circumstances ventilation is desirable or necessary; the type of ventilation to use; the kind of ventilation apparatus to use; the space requirements; the advantage of ventilation; the cost to install and operate ventilating apparatus; and how to go about securing the designing and operation of the system.

Answers to the Architect's Questions

Going back now to our list of considerations, we shall endeavor to give definite information, not expecting the architect to become an engineer, but in an endeavor to give such general information as may enable him to better visualize the kind of heating and ventilating apparatus best suited to the various kinds of buildings, so that he can discuss them with clients, have some idea of their relative merits and of the space, chimney, fuel storage and other such requirements, together with a better understanding of costs to install, costs to operate and the general results to be expected. We shall not attempt in this article to go into details, but to cover primary factors. The detailed standards to be employed, particular kinds of apparatus to be used, exact space and other building requirements and provisions, and human relationships will be more fully treated later.



Typical Gravity One Pipe Steam System



Typical Two Pipe Gravity Steam System

Heating Systems for Residences

Warm Air Furnace Systems. The pipeless warm air furnace is the cheapest to install, and for a small residence of not more than two stories, where all first floor rooms open off of a central room or hall and the upper rooms open off of the stair hall, it is very successful.

The piped warm air furnace is the next higher in price and may be made very successful for any residence, provided the apparatus and piping are of proper design and capacity. Warm air furnaces with fans are more positive in their performance, but they generally cost more than the others to install and to operate. Warm air furnaces are usually coal- or coke-fired, may be very successfully gas-fired, and are sometimes oil-fired. Oil-firing is rarely successful with old style cast iron, built-up warm air furnaces on account of the burning or warping of the furnace and the leakage of oily fumes and dirt into the rooms. The newer type of all-steel welded furnace does not present these difficulties. Warm air furnaces require on an average of from one to one-and-a-half tons of coal or coke per average sized room of residences per season in the colder climates of this country, which corresponds to from 25,000 to 35,000 cubic feet of 500 B.t.u. gas and from 140 to 210 gallons of furnace oil. Some recent developments in gas-fired, copper-tube, fan, warm air heaters seem to have materially increased this efficiency, so that the consumption of gas may run as low as 20,000 cubic feet per room per season. Warm air furnaces have these advantages:

- (a) Low first cost.
- (b) Combining heating with ventilating.
- (c) Quick response; heating rooms rapidly.
- (d) Absence of unsightly, inconvenient radiators.
- (e) Absence of escaping steam or air from air valves in the room.
- (f) Humidity as well as heat, in best types.

They also have certain disadvantages:

- (a) Lack of uniformity in the distribution of heat, due to the action of the wind, or other weather

conditions against any particular room or side of the house. Such conditions may retard the flow of warm air from the furnace to the particular rooms by preventing the outward leakage through the cracks of windows and doors, or by unduly chilling certain walls so that the warm air cannot properly overcome this chilling effect, especially during heating up periods.

- (b) Leaks between the fire pot and the heated air chambers in the old style cast iron, causing fuel gas and dust to pass to the rooms being heated.

- (c) Susceptibility of the fire pot to warping, cracking and the opening of joints, due to the uneven and sometimes excessive temperature, resulting in increased leakage of gas and dust into the rooms.

- (d) Rapid deterioration of the furnace, due to the overheating with air only, with no water on the outside of the fire pot surfaces.

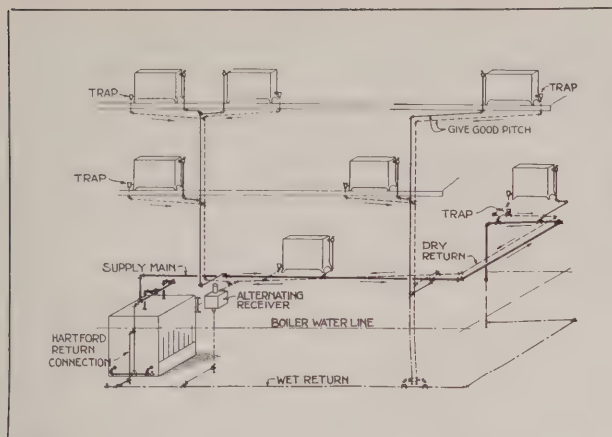
- (e) Difficulty of changing or extending the system to accommodate additional rooms.

- (f) Low relative humidity and drying effect of the heated air, especially in close proximity to the warm air inlets.

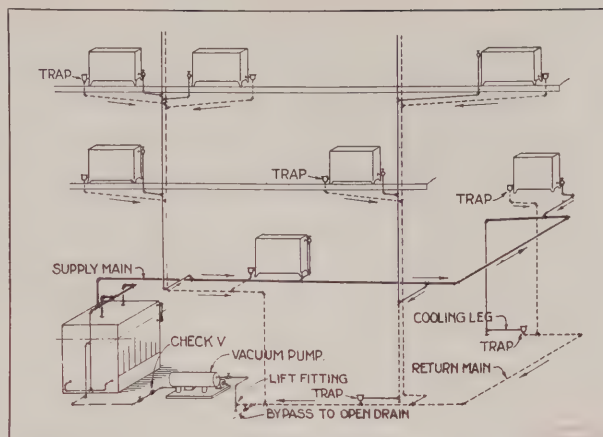
It should be noted that most of the difficulties under (a) may be eliminated by proper design and the use of indoor recirculation or fan-equipped heaters. Also that most of the difficulties under (b), (c) and (d) have been eliminated in some of the latest and best designed types of heaters.

For general data as to building, chimney and wall stack requirements, it is well to refer to pages 207, 208, 211, 212, 216 and 217, of the American Society of Heating & Ventilating Engineers' Guide, 1928. Warm air heating should conform with the Standard Code of the National Warm Air Heating and Ventilating Association, Cleveland.

Steam Heating Systems. The one-pipe gravity steam system is the next higher in first cost to the warm air furnace and is the cheapest and simplest type of steam heating system to install. Its operation is very satisfactory when it is properly designed and installed, but it is susceptible to many difficulties of poor circulation and noisy operation due to the steam's flowing to and the condensate from the



Typical Gravity Vapor System With Receiver



Typical Installation Using Vacuum Pump

radiators through the same pipes. Air valves must be used on radiators and mains with this system, and they may give trouble and annoyance from leakage of steam and water and the discharge of odoriferous air into the rooms. This system is not adaptable to fractional control of heat and must be run with the radiator supply valves either wide open or tightly closed to prevent the retention of water and consequent noise due to intermittent flow of water and steam, which occurs when a valve is partly open. It is also slow to respond to irregularities in the steam supply, since the system tends to fill with air every time the steam drops below atmospheric pressure, and much time is lost in expelling this air through the small air valve ports as the steam is again raised. Some relief can be had from this difficulty by using a non-return type of air valve on radiators and mains.

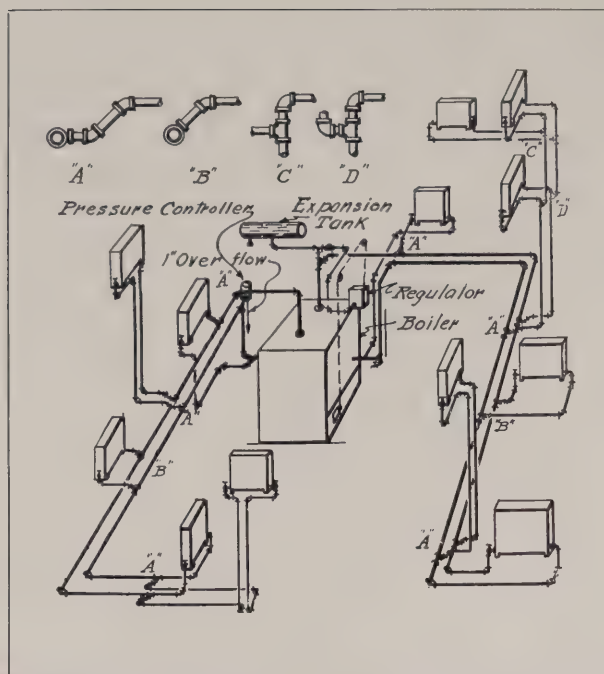
Two-pipe gravity systems circulate more freely, but are susceptible to the backing up of steam through the returns from one radiator to another unless each return is connected separately to the return mains below the water line, which greatly increases the cost and multiplicity of pipes. Air valves must be used with this system, and it is susceptible to all of the difficulties of the one-pipe system not covered here, and is fast going out of use. Non-return air valves cannot be successfully used where the returns are connected below the water line.

Vapor systems are the latest of two-pipe gravity steam systems and are generally the most satisfactory steam heating systems for residence work. They differ from the gravity two-pipe systems in four important particulars: (1) by means of thermostatic or other forms of automatic traps on the return ends of all radiators the steam is prevented from entering and building up pressure in the return systems; (2) the air is eliminated from the radiator with the condensation through the radiator returns into the return system and thence to the atmosphere through automatic vent valves or other forms of automatic air-venting apparatus near the boiler instead of through individual air valves on the radiators in the rooms; (3) the backing up of water in returns may be prevented by the carrying of exceedingly low supply

pressures; (4) real fractional control of the amount of heat is possible. In vapor systems, boiler protection is given by devices supplementing the damper regulator and may be in the form of an alternating receiver, return trap, equalizing or differential unit. An approved return connection is quite extensively used in place of a check valve for partially preventing water from leaving the boiler. Vapor systems usually are provided with vacuum venting valves at the boilers, which prevent air from returning through the vent ports, thus permitting the formation of a partial vacuum when the generation of steam pressure above atmospheric ceases. The cost of a vapor system is from 10 to 20 per cent more than the cost of a one-pipe system.

Vacuum return-line systems are not used in residence work except for unusually large houses. They are similar to vapor systems in every way, except that a pump is used to produce a vacuum in the return system by removing air and water. They permit wider variation in pressure differences between steam and return mains. They are installed in buildings where it is required to operate at low initial pressures or where, by reason of the layout, radiators must be located below the water line of the boiler. This type of system is also well adapted to large groups of widely separated buildings. It is generally used where exhaust steam is available, as it can be operated on a low back pressure without appreciably decreasing the capacity or economy of steam engines. A vacuum pump is used to accelerate circulation by discharging both water and air, the water being returned to the boiler and the air vented to the atmosphere. Because of the greater pressure differential of vacuum systems, the result of faulty grading of piping connections is less serious than in the other systems mentioned, and the returns can be smaller. Refer to American Society of Heating and Ventilating Engineers' 1928 Guide, page 86, for diagram of this system.

Hot Water Heating Systems. Hot water systems are generally the most satisfactory and economical for residences where the operation is continuous and when it is not intended to leave the system without



Closed Hot Water Heating System, Showing Connections

attention for long periods during cold weather, when the water might freeze. They are slow to respond to irregularities in the condition of the fire or to compensate for sudden changes in weather conditions. They are very adaptable to either hand or automatic temperature control, and with automatic control and continuous operation give little or no difficulty on account of slow response or in compensating for varying weather conditions. Gravity hot water systems are susceptible to difficulties arising from faulty design or workmanship, since the motive power for circulation is very small and the flow currents are easily diverted or short circuited. Forced circulation systems are positive, but they are generally too costly to install and operate for residence work. The one-pipe gravity hot water system is the cheapest to install, but is not much used because of its comparative sluggish and uncertain operation. The two-pipe system costs about the same to install as a vapor steam system and should show some saving in fuel. One-pipe systems are somewhat cheaper, as they require no special accessories, but they do require larger pipes and more radiation than the closed systems. They are also limited to a water temperature of about 180° Fahr., and are therefore not so flexible in capacity or control. The closed type may have the tank in the basement or be of the pressure-reducing valve and relief valve type of system, and is perhaps the best type of hot water heating for residences.

Gas heating may be used in the form of gas space-heaters or gas-steam radiators as auxiliaries for breakfast rooms, bathrooms or other special rooms where heat is required when the regular system is not in operation, or for early morning heating. Gas may also be used for gas-fired boilers or furnaces.

Electric heating at present is usually too expensive for general residence heating, but it may be employed as an auxiliary. In certain locations where water-power electricity is cheap and fuel is high in cost, it may well be used. Electric heating with current at 5 cents per k.w. hour is about 15 times as expensive as steam heating with coal at \$15 per ton.

Hot Water Service. This service for a residence is usually a comparatively small load and can be combined with any of the systems mentioned by a copper coil or cast iron heating element in the fire pot of the furnace or hot water boiler, or by iron shell copper coil heaters connected in local circulation below the water line of steam boilers. Care must be exercised in placing coils or other heating elements in the fire pot to keep them out of the way of firing or the cleaning of grates, so as not to interfere with the efficiency of the boiler or furnace. The heating of water in summer is usually taken care of by gas-, oil- or coal-fired heaters connected in parallel with the winter heaters.

Office Building Heating. The hot water requirement of office and other commercial buildings is generally an appreciable load and is usually taken care of by a separate boiler or heater. If exhaust steam is available, a separate steam heater may be used; otherwise a separate steam boiler with a tank coil heater attached, or a coal-burning heater or combined refuse burner and water heater may be used. Care should be taken to have a heater capable of withstanding the water pressure in tall buildings. Forced circulation hot water is a most satisfactory and economical system for this class of building, but it costs more to install and must be arranged so that there will not be excessive static pressure on the radiators. The obstruction and unsightliness of basement supply mains can be avoided if space is available for overhead mains above the top story. Overhead mains allow the use of smaller down-feed "risers," produce better circulation, and by running the returns in trenches in the basement, all exposed piping may be done away with. By dividing the system into sections corresponding to the varying requirements for heating due to changes in the sunshine, wind and exposures on the various sides or wings of a building, either automatic or hand control may be applied for equalizing the heat so as to save fuel and prevent overheating. By the application of some form of automatic vacuum or pressure control and balancing features, the heating may be kept in step with variations in the outside temperatures.

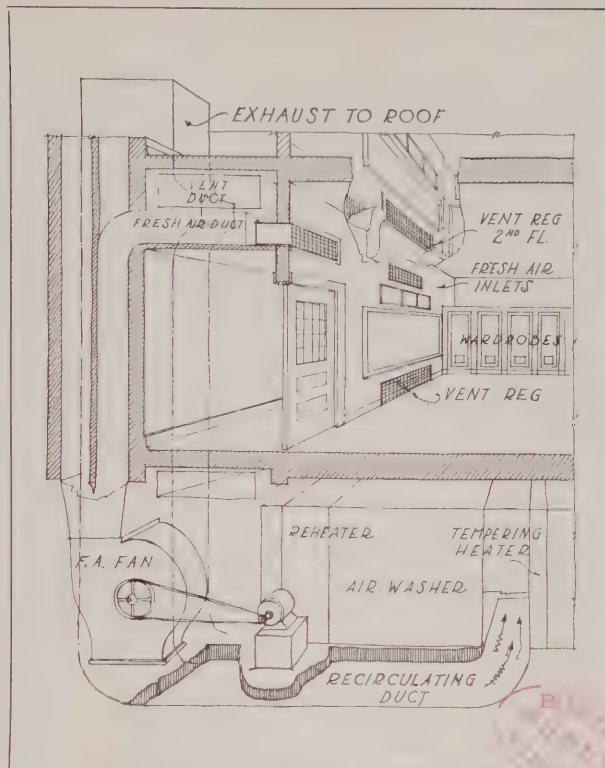
Hotel and Apartment House Heating. The domestic hot water requirements are relatively heavy in these types of buildings, and frequently run as high as 25 per cent of the total heating load. It is not generally advisable to heat this volume of water with coils or surfaces either in the fire box or in the water circulation of the house heaters. If the water heating is to be done from the house heaters, these should be divided into units so that one or more may be used on this service alone in the summer, when other

heating is not required, without being too large and therefore uneconomical for operation on this load.

In hotels where kitchen equipment is to be supplied with steam at about 30 pounds pressure, or laundry equipment at about 80 pounds pressure, it is general practice to generate all steam at about 100 pounds pressure and supply the heating system, the domestic water heaters, the kitchen equipment and the laundry equipment through separate pressure-reducing valves set for the respective purposes. Where refrigerating apparatus is employed, it will generally be found that the steam required to operate this will produce exhaust about sufficient to heat the domestic hot water. A very economical arrangement is to have steam-driven refrigerating units with tank heaters using this exhaust steam for heating water. Care must be exercised to have the hot water storage tanks of ample capacity, as the refrigeration load is practically constant while the hot water demand fluctuates from 10 to 300 per cent of the average hourly load, and unless the storage tanks have a capacity of from one and one-half to twice the maximum hourly demand, much of the exhaust may be wasted, especially in the summer months. Separate water heating apparatus consisting of tank heaters connected directly to storage tanks by means of local water circulating pipes, or of steam or water boilers connected to coil tank heaters, are sometimes used, but it is generally found best to do all of the heating from one central boiler plant.

Hotel and apartment house ventilation is generally employed in kitchens and public toilets; frequently in dining rooms, ball rooms, assembly rooms, public spaces, laundries, boiler rooms, engine rooms, store rooms, and all interior bathrooms. Exhaust ventilation without fresh air supply from other than adjacent spaces is sometimes employed for kitchens, toilets, laundries, boiler rooms, engine rooms, store rooms, and interior bathrooms, but care must be exercised, in using exhaust ventilation alone, to prevent disagreeable drafts through doors and other openings, to prevent interference with the draft in the boiler room, and to prevent interference with proper heating due to the increased leakage of cold air from the outside. A properly heated or cooled, cleaned and moistened supply of fresh air should be used in conjunction with exhaust ventilation for dining rooms, ball rooms, assembly rooms, public spaces, boiler rooms and all other spaces where the supply cannot be properly taken care of from adjacent rooms. This requires heating in winter and, for the better classes of ventilating, cooling in summer. The heating of air for ventilation in colder climates requires from 3 to 5 tons of coal per season, per 1000 cubic feet of air per minute delivered; cost of power is from \$25 to \$40 for that amount of air.

The cost to install good ventilation may range from 1 to 3 per cent of the cost of the building, depending upon the relative amount of space to be ventilated. The cost to operate can be very materially reduced where a generating plant is used, from



Central Fan Split System for School Use

which the power and exhaust steam may be taken, or where recirculation is employed, and in many such cases it may be reduced to practically no additional cost for the operation of the best kind of ventilation. In many localities the ventilation of interior toilets is compulsory under certain laws prescribing gravity or mechanical systems.

School and Public Building Heating. School heating is either by gravity warm air furnace, fan furnace, steam or hot water, and is usually combined with some form of ventilation. In furnace installations the ventilation is an integral part of the system. In steam or hot water installations, the heating may be by direct radiation with either a central fan system, individual ventilating units or a gravity system for ventilation, or by a combination system of heating and ventilating using a central fan or units. Steam or hot water with direct radiation in the rooms and fans or units for ventilation is a generally accepted standard for colder climates, while the combination system of heating and ventilating with warm air by central fans or units is employed for milder climates. The former is commonly known as the "split" system, while the latter is termed the "hot blast" system. The hot blast system is simpler and cheaper, but it requires the delivery of the air in cold climates at from 15 to 25 degrees Fahr. above the temperature of the room, with consequent excessive dryness of this air before it is cooled to room temperature. In the absence of any direct radiation, the chilling effect of exposed walls is hard to overcome with warm air alone, so that in some cases the temperature adjacent to these walls will remain quite low for con-

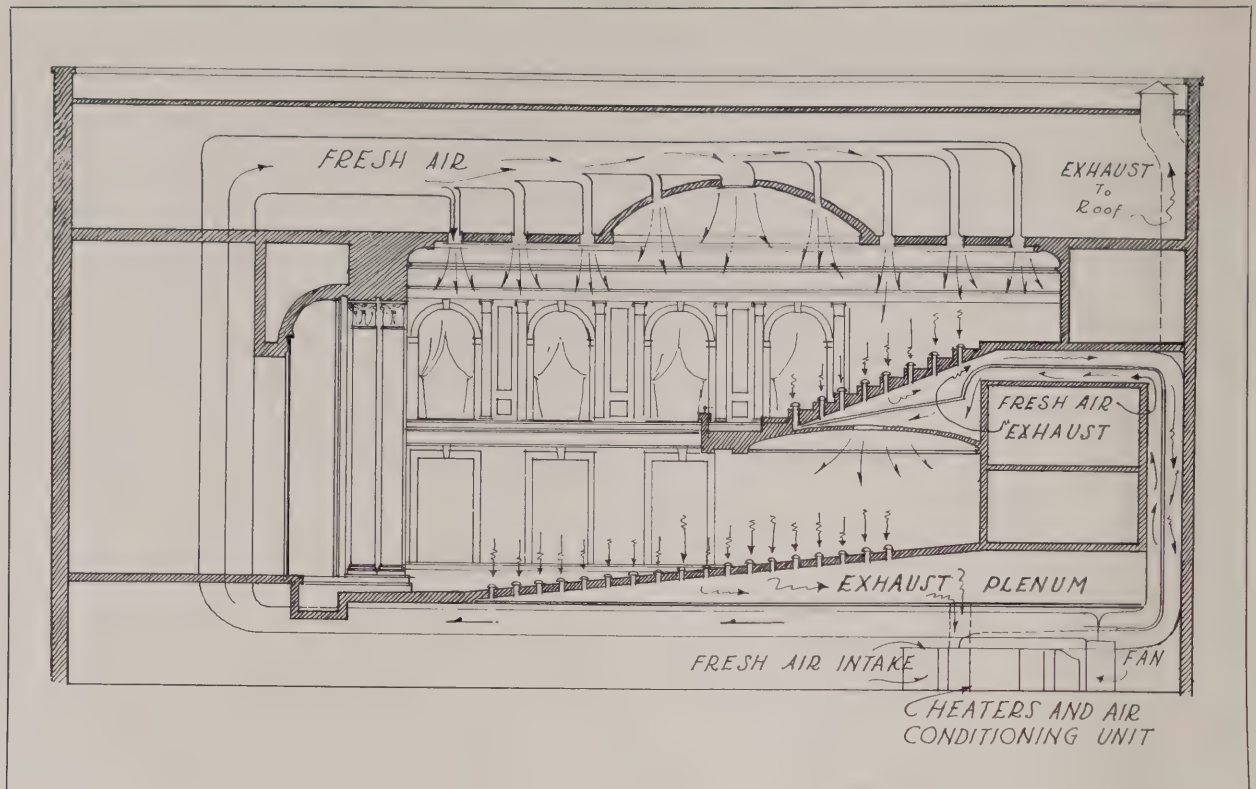


Fig. A. Downward System of Ventilation for Theaters

siderable periods in the mornings in cold weather.

Steam or hot water systems with direct radiation in the rooms may employ gravity ventilation either in the form of fresh air supply ducts, with warming stacks at their bases and exhaust flues running to ventilators above the roofs, or the fresh air may be taken in through the windows and be exhausted in the same way. These systems are not positive or under control in their action, and are subject to all of the vagaries of wind and weather conditions. The former is one of the old and practically obsolete forms of schoolhouse ventilation, while the latter though much older is one of the latest to be advocated by some and as thoroughly condemned by others. These systems conform to no particular standard, produce no definite results, and save nothing either in the cost to install or to operate. Upon first thought it would appear that the so-called open window system would require less space and cost less than almost any other system, but when thoroughly analyzed, and if installed in accordance with the requirements laid down by those who have experimented with it most, it not only costs more to install but requires a greater building cost and greatly increases the costs not only to operate the heating and ventilating system but for the general school administration as well, and there is decreased pupil capacity.

Recently several schemes have been suggested for supplying unheated or very slightly tempered air, by mechanical means, through a narrow opening all along the window stools of classrooms to take the place of the natural air supply through the open

window, and for dividing the radiators under windows into two or more horizontal sections for better temperature control. The June, 1926 and March, 1928 A. S. H. V. E. *Journals* give descriptions of these suggestions. Unit systems generally employ vertical gravity exhaust ducts running up from each room to ventilators above the roofs, but the exhaust may be into corridors, thence through ducts to the roof or into horizontal ducts furred down over corridors and thence into main vertical ducts discharging above the roofs. Where vertical ducts in the rooms are eliminated, this system requires the least space of any. The piping system to and from the units and the electric supply to unit motors are increased over the requirements for central systems.

The central fan system may employ vertical supply and exhaust ducts for each room, or the supply and exhaust ducts or either may be furred down over corridors and connect into main vertical ducts to eliminate all vertical ducts in rooms. There can be fan supply and gravity exhaust, gravity supply and fan exhaust, fan supply and fan exhaust or one fan for supply and partial exhaust recirculation with gravity exhaust relief for the portion of the air not recirculated. This latter system, when properly designed, is one of the cheapest to install and to operate and can be controlled to uniformly give any results desired. An accompanying diagram illustrates a central fan, split system, where both the fresh air and vent ducts are furred down over the corridor ceilings and where one fan is used with partial recirculation. The fan and other apparatus

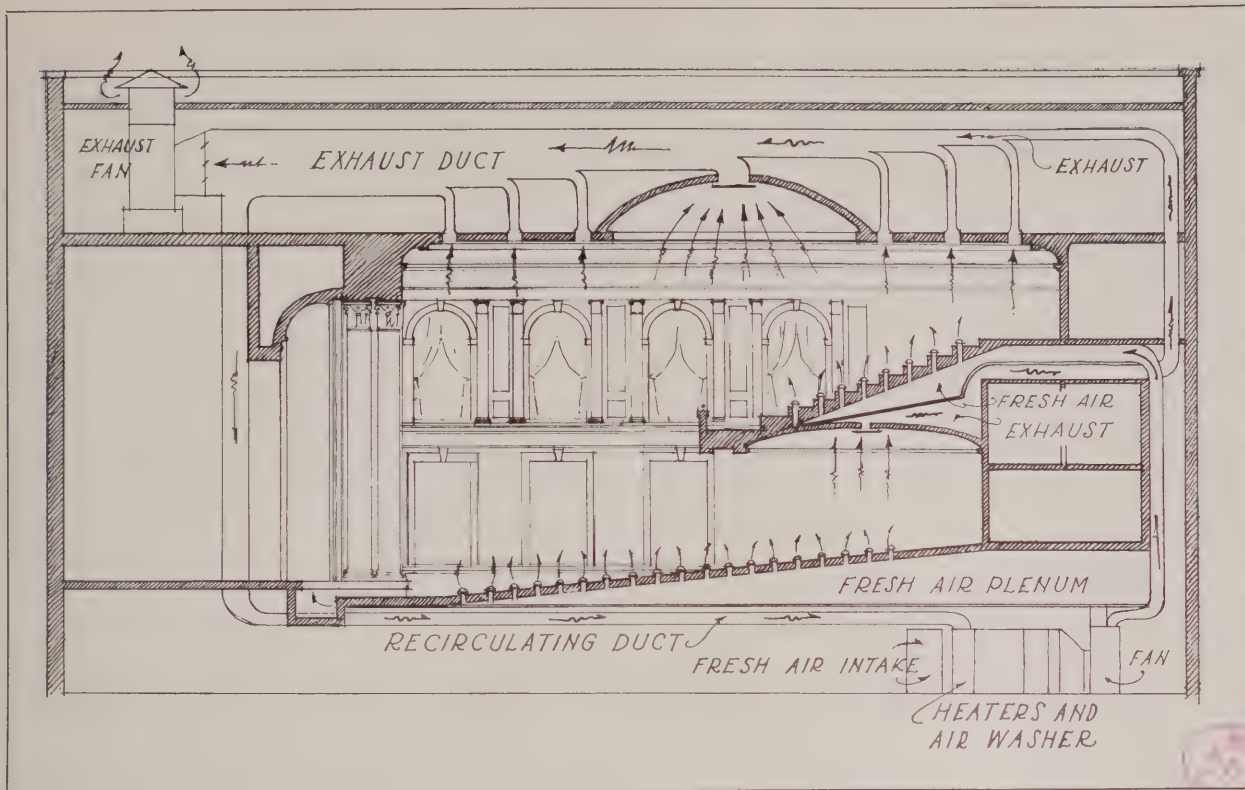


Fig. B. Upward System of Ventilation for Theaters

may be placed in a pent house on the roof in this type of system, instead of as shown, thus eliminating these and the large piping in the basement. In any of these systems ventilating units may be used to take the place of the supply fans, heaters, air washers, and air filters, in which case the fresh air ducts are also eliminated; but the piping must be increased to take care of the steam and returns to the units. The removal of foul air from the rooms may be either by gravity vents or by means of exhaust fans.

The opinions and convictions of the school authorities, especially of those who are to use and operate the apparatus, should always be given due consideration in connection with the heating and ventilating of any school building. There is a deep-seated conviction in the minds of some school people at the present time that the apparatus should be controlled by the teachers and not by the janitor. Some principals and teachers support this idea and assume its responsibilities and, where they cannot be convinced to the contrary, it is my experience that they are better pleased with the results produced under their own control than they would be with any results the janitor could deliver, even with the best apparatus and automatic control. This idea has done more perhaps than any other one thing to popularize unit and open window ventilation, and while these methods have such advantages as making it possible to do away with the fresh air distribution systems and otherwise simplify the installation work so that more of the apparatus can be fabricated in responsible factories instead of on the site by less skilled contract-

ors, they have disadvantages such as not being susceptible to as satisfactory an arrangement for air cleaning, humidifying and other proper conditioning and control as has the central system. It is also a fact that a properly designed central system arranged for automatic control and partial recirculation can usually be operated more economically than most other systems producing equal results.

The proper care and operation of any system is a most important factor, and for this reason those who are to use and operate the particular system must have confidence and interest in it; otherwise it is doomed to failure from the start. In all public schoolhouse heating and ventilating, the requirements of the local laws must be complied with. These laws generally provide that the heating apparatus shall be capable of heating to 70° Fahr. inside with an outside temperature of 0° Fahr., and that the ventilating apparatus shall be capable of supplying not less than 30 cubic feet of properly heated fresh air per minute per pupil, in all classrooms. Assembly rooms, gymnasiums, social service rooms, cafeterias and such other spaces as are used at times when other parts of the building are not in use, should have separately controlled heating and ventilating systems. School toilets should be ventilated independently of the remainder of the building.

Public Buildings. Other public buildings present various problems, but are generally heated with steam or hot water and ventilated by one of the methods referred to here. Assembly halls, court rooms, large work rooms, public toilets, engine

rooms, boiler rooms and store rooms are usually ventilated. Good exhaust ventilation of ample capacity proves very satisfactory, except for theaters and public auditoriums where both fresh air and exhaust should be used with arrangements for cooling and dehumidifying in the better class of well patronized theaters. The problem in these is generally that of cooling and ventilating rather than of heating and ventilation, even in winter. This is due to the fact that in this class of building, where exposure is relatively small and the heat given off by the audience, and by the lighting and the power equipment is relatively large, the amount of heat thus liberated in the building is greater than that lost to the outside.

Downward ventilation with fresh air and partial recirculation admitted through numerous grilles at the ceilings and exhausted through numerous mushrooms under the seats, is the best system for this type of building, provided refrigeration and dehumidifying apparatus are provided for summer use, but the upward system with fresh air admitted through numerous mushrooms under the seats and exhausted through grilles in the ceilings, and especially under and over galleries, is better if cooling and dehumidification are not used. With the downward system and cooling, smaller fans and ducts may be used, and an average of about 8 cubic feet of fresh air with 24 cubic feet of total air circulated per person per minute may be used, while from 30 to 75 cubic feet per minute per person is required with the upward system and no cooling. Fig. A illustrates a downward system of theater ventilation, while Fig. B illustrates an upward system. Smaller auditoriums may be ventilated very successfully by separate units or by central fan systems delivering air on each side of, or over the proscenium arch,—or sometimes from the rear toward the stage, with either gravity or fan exhaust from near the floor in front of the stage and through the ceiling under and over the galleries. It is always preferable to have the flow of air from the stage toward the audience as an aid to acoustics. Such systems should handle about 30 cubic feet of air per person per minute, and may be partially recirculating. They are very much less expensive than the more elaborate systems.

Hospital and Institutional Heating. Hot water is one of the most satisfactory and economical systems to operate for this type of heating, but because the boiler plant is usually located at some distance from the buildings, long and large transmission systems with forced circulation and a considerable amount of water heating equipment are required, which increases the first cost to from 15 to 20 per cent above that for a steam system. Cost of equipment may be reduced by employing direct-fired hot water heaters or boilers, but inasmuch as steam is required throughout for kitchen, laundry, sterilizers, warmers, etc., steam boilers are also required, which in turn increase the number and cost of "stand-by"

units and prevents the alternate use of the boilers on either system. In some hospitals the height of the building would cause excessive static pressure, and in any case a hot water leak would be a very serious matter in this kind of building. Space requirements are also increased, so that in many hospitals and institutions steam is the heating medium used. Direct radiation is usually employed and should be of an open type easily cleaned and hung on the walls 6 to 8 inches above the floor, 2½ inches from finished walls and with supply and return connections running from walls instead of up through floors. Air supply is sometimes provided either back of or over the radiators for ventilation.

Radiators in operating rooms should be set back of a shield (usually of glass) with access doors and grilles for circulating the heated air to the room. The domestic hot water requirements are much the same as for hotels, and the coördination of this with the heating and refrigeration may be treated in the same way. Operating rooms, bathrooms, examination rooms, defective patients' rooms, etc., often require heat in the summer and should be equipped with auxiliary radiation fed from the high-pressure steam system through pressure-reducing valves and returning separately or through the high-pressure returns to the boiler plant. Ventilation should be employed in sink rooms, food service rooms, wards, corridors, laboratories and nurses' stations, in operating rooms when desired, and in other parts as was recommended for hotels. Private rooms may be ventilated, but present custom is to rely on windows with some good type of ventilation sash, window deflectors or special window intakes with enough radiation under windows to compensate for the incoming air. Ventilation elsewhere usually requires only exhaust fans, but where clean air cannot be taken in through windows, supply systems should also be used with air cleaners and washers.

Industrial Heating. Industrial heating may be by direct radiation, but this is fast giving way to unit heating, especially for rooms with high ceilings, as units are cheaper to install, cost less to operate and obstruct less of the side wall and window space. Unit heating and air conditioning apparatus is available. Central fan-blast systems are also used and are advantageous where air conditioning is required, as the control and distribution can usually be well worked out. Overhead ducts are sometimes undesirable as they obstruct light, but at other times "units" are sometimes undesirable, as they may constitute a floor or overhead obstruction.

The illustrations on pages 592, 593 and 594 are from the A. S. H. & V. E. Guide.

Editor's Note. Mr. Perry West's next article will continue the consideration of Heating and Ventilating for the Architect, taking up the theoretical and practical standards of heating, ventilating and air conditioning for various types of buildings.

RAMP PROBLEMS IN GARAGES

BY

K. F. JACKSON, C.E.

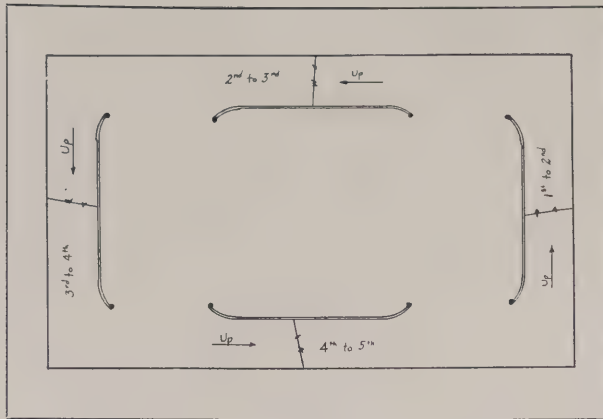
HAD one stood for say two minutes just before nine in the morning, and again during mid-afternoon at a prominent intersection of streets in any American city a dozen years ago, and should he repeat the experience today, he would immediately appreciate the *raison d'être* of the large metropolitan garage. I am doubtful whether he would require the two minutes. A glance would almost be sufficient for him to make three observations,—he would surely be impressed by the large and increasing number of business people who are “commuting” by automobile; by the many cars which are bringing the great army of shoppers to the stores; and finally by the vast number of cars and trucks of every description, which are employed in the transaction of modern business. Given these conditions, the inevitable result is two-fold: a dearth of space for standing vehicles in the streets and squares during daylight hours, reflected in ever more stringent parking regulations, and a tremendous need of housing accommodations for fleets of trucks at night. Thus there has been created a distinct construction necessity which is engaging the attention of promoters and builders, and through them, of capital,—namely, the city garage.

For several reasons these buildings must all take the same general form. The high value of property within city limits necessitates a large amount of floor space in proportion to the area of ground covered, which means that they must be multi-storied. Similarly, economy of operation, requiring a small staff for management, allows but a minimum number of entrances and exits. These features, together with other limitations as to size and speed, render elevators impracticable and make imperative some system of ramps from street level to top floor. Before taking up consideration of the various types of ramps which have been evolved and applied, it might be well to note certain typical requirements to be met in all city garages, for the more perfectly and completely met, the more successful the garage as a business venture. Since the primary requisite of any building erected on a commercial basis is that it shall yield at least the usual return on the capital invested, those financially interested are concerned with a few of the broader, more comprehensive essentials. First among these is the location, upon which depend several important considerations. Are its potentialities sufficient, provided the business can be secured? Are the expected patrons likely to use the garage facilities if presented to them? What about competition, present and future? Is the district over-garaged? Is it likely to be? All of the foregoing is in fact beyond the scope of this writing, and is touched upon here merely for the sake of completeness. Henceforth it will be assumed that a suit-

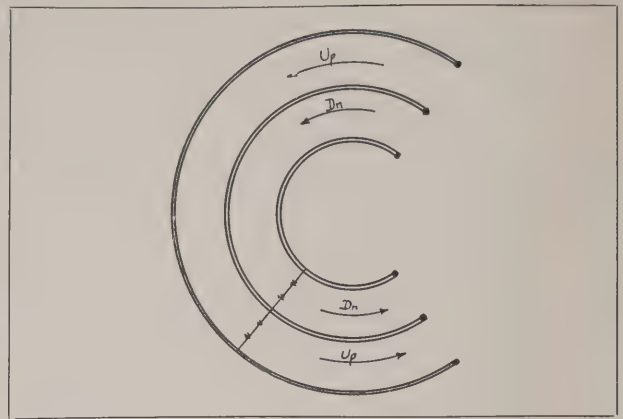
able site has been selected, that a client is desirous of building, and that the financing is available provided a profitable undertaking appears likely.

Of large significance is economical operation, which in turn hinges on several points to a varying extent, yet all deserving of intensive study in order to produce the desired result. These points will be covered subsequently in detail. Summarized, they are: (1) minimum personnel for management, (2) rapid movement of car traffic, (3) provision for efficient classification, and (4) maximum accessibility of cars. Another aim of scarcely less importance is to so arrange plans as to derive the best use of the allotted floor space; the maximum parking capacity must be realized. This is a broad statement, however, and should be amplified. The reaction of the patron to the entire plant is paramount. A 500-car capacity garage which, on account of its physical characteristics, can only maintain a steady patronage of 300 is much less to be desired than a 400-capacity building so attractive in its appointments that it can command 350, except under extraordinary circumstances of weather or whatnot. The number of vehicles accommodated and actually yielding revenue determines the soundness of the investment. Lastly in this category of considerations is convertibility. All cities are to a certain extent mobile. The character of a locality is subject to change. Business is not sufficiently stabilized to maintain centers, and this shifting process may so alter conditions that the garage building must be adapted to new uses. This is a matter of perspective, however. The true purpose of the project should not be eclipsed by a lesser possibility considered too closely. A garage is to be built, and the most efficient arrangement for such should be accorded greater weight than remote futurities. Yet some exercise of thought is needed, and if a strong doubt exists as to the continued fitness of a site for garage purposes, it would be better to select another site.

An analysis based on these considerations will, as already said, fix the status of the projected garage,—whether or not it is likely to be successful. The succeeding elements will determine to a large extent the degree of success which may be attained. In a garage such as has been outlined, of several motors and probably with a single entrance and exit, one of the important problems for solution is that of securing rapid movement of cars. This is particularly the case in an establishment catering to drivers who leave their cars in the morning and remove them in the evening. All arrive and all leave at approximately the same hours, which creates twice daily peak conditions. Nothing is more annoying to the average motorist than to be held stationary with motor running, breathing exhaust fumes with in-



Straight Run Ramps; No Sharp Turns; Good Visibility



Ingenious Variation of Spiral Ramp; Outside Spiral Up; Inside Spiral Down

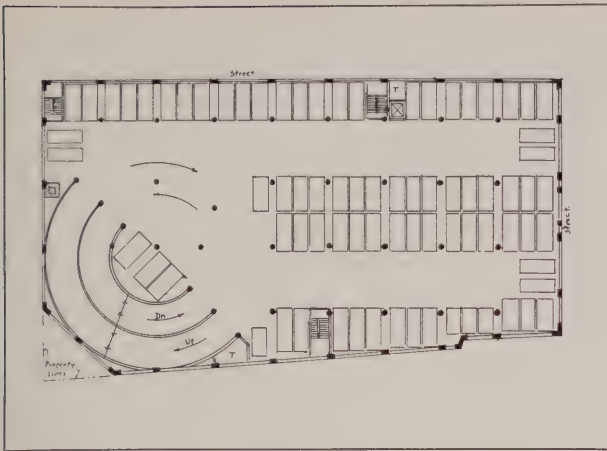
creasing impatience. It does not require many experiences of this sort to effect a change in patronage. The next time he will park his car somewhere else.

Obviously the fast movement so necessary can be accomplished by eliminating all causes of delays, notably by facilitating entrance and exit with level or nearly level driveways, with no blind corners; by affording ample magazine space, that is to say, a sufficiently long run on the ground floor to permit of classification of a car at entrance and checking off at exit without actually stopping the car; by an easily negotiated ramp, about which more will be said later; and by arranging the parking off the traffic lanes. A certain amount of jockeying to get in or out of a stall cannot be avoided, but this maneuvering should not interfere with other cars. To accomplish this, there will necessarily be sacrificed some floor space, which is utilized for subsidiary parking aisles leading away from the main driving aisles. It will be found well worth while, nevertheless, to get rid of any clogging moving traffic from this cause. It should be noted in the typical floor plans reproduced a little further on that due attention has been accorded all these points. The start of the ramp is placed at a comfortable distance from the street entrance, thus allowing for proper classification of entering vehicles, and similarly for checking them out. Likewise, virtually all car stalls are facing on parking aisles. The necessity of having maximum parking space comes next after these. Cars should be readily accessible to avoid delay to drivers. Much time and effort can be expended needlessly in moving one or more cars to release another. Some cars are known quantities in respect to the time they will be called for, and consequently may be blocked temporarily, but for the most part, cars must be free to be moved at any and all times. The sketches included here illustrate this point also. Above all, it should be possible for any driver to ascend the ramp and maneuver his own car. A ramp which requires the services of an experienced attendant is a liability and will never wear out from use. Another refinement too frequently forgotten is the minimizing of

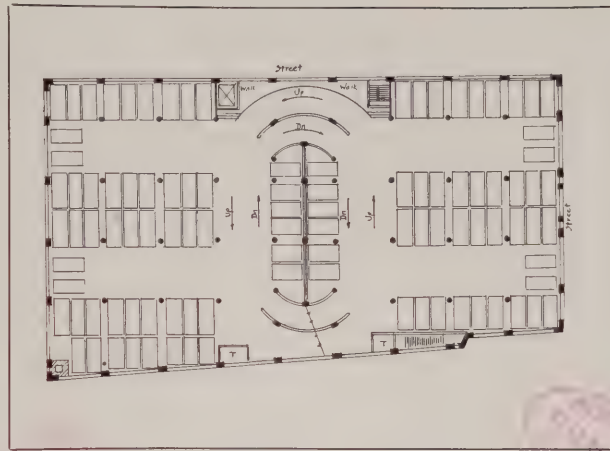
the amount of walking which must be done to and from the car stall to the stair or elevator, and the provision of a place to walk without dodging between moving cars and having a slowing effect upon them. Every stall cannot be adjacent to a means of ascent and descent, but no stall need be very far away, and the majority can be comfortably near.

Turning now to a contemplation of the features for which to strive in the ramps themselves, it is quite natural to find them dovetailing to a large extent with the previously mentioned requirements applicable to garages in general. All of the advantages to be enumerated here cannot be obtained, inasmuch as some are in opposition to others. They will be commented upon separately for clearness, and it is to be realized that in any particular garage, all are worthy of consideration, and where conflict exists, the conditions pertaining must determine their relative merits. In most cases, a nice adjustment is the solution, and a compromise giving the best ultimate result will have to be worked out. Insofar as possible, a ramp should have an easy and not too varied percentage of grade, ample turning radius for the largest cars, width enough for comfortable driving, and good visibility. The reasons are apparent. All contribute to the speed of traffic, to the satisfaction of patrons, to minimum wear and tear on cars, and hence to economical operation and increased patronage, the two greatest virtues of any garage. These various points will enter the later examination of the types of ramps and what advantages each offers.

Some additional thought should be devoted to reducing the amount of valuable space sacrificed to the ramp, and also to the ramp's flexibility. By this is meant the quality which will permit of varying story heights without resulting in too steep grades or too great variations in grades. It is frequently advantageous to plan a garage for the accommodation of trucks on the lower floors and passenger cars above. The trucks will require somewhat more headroom, yet the arrangement of the ramps would preferably be typical in the several runs. Otherwise, drivers will become confused and cautious, with a general



Circular Spiral Ramp



Elliptical Spiral Ramp

slowing down of traffic resulting. Sudden changes of grade will produce a like effect, and must accordingly be guarded against. A ramp with a low grade is the only kind which can satisfactorily meet this condition, and such a ramp, unless ingeniously planned, will be prodigal of space occupied. There is a way to avoid this disadvantage, as will be shown. The cost of constructing the ramp is also of some moment, though it can scarcely be called important except in the case of a small structure. A fairly safe rule to adopt is this,—select the type of ramp which will satisfy the conditions and afford the greatest number of physical advantages, and its cost will be taken care of in the service rendered.

Ramps at their worst are not exceedingly difficult of erection, although the work requires a skilled and experienced building superintendent. Some are more difficult than others,—much more,—and all should have better than ordinary attention. The most involved part of the work is completed with the construction of the forms. Excellent ramps have been and will continue to be built. A little more perplexing than in the usual construction is the placing of the reinforcement, yet similar problems are encountered every day in variously pitched roofs. Needless to say, a little extra care in mixing and pouring the concrete is desirable. This is merely to offset the human equation, to compensate for the slightly greater chance of a flaw in the work due to its complicated nature.

There is a further item of cost in connection with ramps which must be noted, and the reference is made to royalties. Many patents have been taken out on ramp systems and ramp features, the large majority of which mean little or nothing. Some there are, on the contrary, seemingly good and functioning. In the interests of impartiality, none of the names will be used here, since the writer might inadvertently neglect to mention some deserving type. The justification of patenting such a thing as a ramp system might appear, at first blush, questionable. The fact remains that such patents do exist, and when it is realized that they represent a tremendous amount

of time and experimenting, as well as the expenditure of much money, one finds scant excuse for protest. Furthermore, their sponsors offer the results of their experience in advice and service, and there is no doubt but that their use results in savings which far outweigh the patent fees. Ramp royalties are generally figured on the base price of 10 cents per square foot of the entire area, and with a sliding scale of discounts depending upon the size of the building. The price of the royalty for a ramp for a garage with a capacity for 500 cars would be say \$10,000.

The several forms of ramps may be now enumerated and the characteristics peculiar to each presented and discussed. Beginning with the simplest, there is the plain, ordinary incline, a straight run from one level to the next, obviously excellent when circumstances make its use feasible. It requires either a very large or very long building, since upwards of 80 feet in horizontal projection is necessary to rise the normal story height without excessive grade. Such a combination of conditions is rarely found, although in passing, there might be mentioned the Motor Mart Garage in Boston, said to be the largest in the world, where ramps of this kind are employed. In this instance the ramps are laid out in such a way that the travel of cars is around the building, succeeding ramps being located on succeeding sides. This arrangement proves very effective, since the driving is made easy, there are no sharp turns, and visibility is good. All parking is away from traffic, and hence there is little chance for delays. The capacity requirement is likewise well met.

The most common type of ramp found in present-day city garages of more than three stories is the curved or spiral type. This classification may in turn be sub-divided into those which are circular in plan, and those approximately elliptical. Both are applicable to the ordinary lot, the shape of which is of no consequence. Commenting on the circular spiral, the outstanding merits are easily summarized. It occupies the least amount of space, thus contributing to one of the principal aims,—maximum capacity. For the same reason, it caters to the feature of

convertibility, inasmuch as the building can readily be adapted to a different use with minimum loss of floor space; or, if alterations are made, small amount of demolition and replacement is necessary. Further, because of the shape and small space necessary, a circular ramp can be tucked into a semi-useless corner or jog. The disadvantages of this kind of ramp are that it is one of the most difficult to build, and hence costly; it is likely to be reduced in size with sharp turning and steep slopes; the visibility is very poor, a driver being able to see only a few feet in front of him; and it is hard to negotiate, especially with a long car. These undesirable characteristics slow up traffic with consequent bad effect, induce strain on the drivers, and cause wear and tear on the cars. At present some modification of this type is most generally in use, and there are doubtless examples of it in almost every city which boasts a large garage. A typical layout for a circular spiral ramp is shown in one of these diagrams. Before completing consideration of ramps of circular plan, mention should be made of an ingenious variation wherein one spiral is within another. The inner spiral is for down traffic, the outer for that moving up. Yet all traffic is traveling in the same direction. The interesting point to be noted is the clever method by which the meeting and crossing of cars going up and down are eliminated. The only other method of accomplishing this happy condition is to supply two distinct ramps in different parts of the garage. An example of this is in the Eliot Street Garage, Boston. The spiral ramp of elliptical plan may be similar to the circular, differing only in that the longer run requires more space, but allows lower grades.

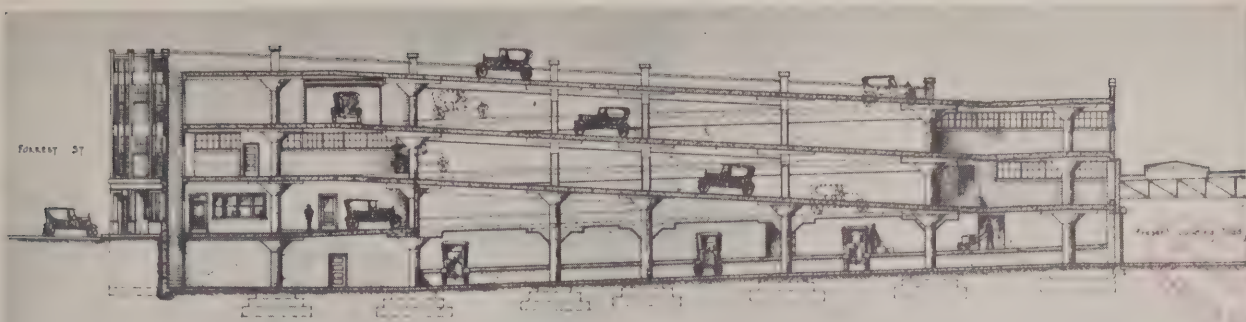
Many buildings are split vertically with the floor levels of one portion staggered with relation to those of the other. The floors themselves are usually level and are connected by half-story ramps. This type is very efficient in car-storage capacity and has been widely used. In this category fall several ramp garages in Detroit, and many examples are found in other cities, such as the Bowdoin Square in Boston. They have proved very successful.

The floors may be slightly pitched upward in a counter clockwise direction and the two parts connected at the ends by short ramps. These short ramps have slightly steeper grades than the floors, but are comparatively gentle. The accompanying sketch will serve to illustrate the plan. Various refinements may be made in the basic type, such as warping of floors; banking of curves; banking of entire driving aisles, since considerable speed can be developed; and location of drainage connections at lowest points. Probably the latest modification of a ramp system on this principle is described in this manner. A continuous ramp, banked at all points, the plan and pitches described from two points, making a ramp of somewhat the nature of a spiral or helix, yet not a true helix; and while this term would indicate a circular plan, this plan is more of an ellipse, with the centers as drain points. In

other words, the entire floor area of the building goes in to make up a continuous ramp to the top, the driving aisle being banked, and the remainder of the floor warped away from it and slightly pitched to the point or points from which the curve of the driving aisle is struck, and to which the water naturally flows and is drained off. The recently built Fourth Avenue Garage in Pittsburgh is of this type, and another is located in Baltimore.

There is much to be said apparently in favor of this system, and little of significance against it. Briefly, its disadvantages are: (1) the limitation as to the size of building, since there must be length enough to give extremely low grades, else its purpose is defeated; (2) the fact that cars are parked on a surface which is sloped, though very slightly,—less, in fact, than the crown of the ordinary street; (3) the lack of general convertibility. A building constructed in this fashion might be used as a warehouse, but there are few other uses to which it could be adapted. The benefits credited to this variety of ramp might be summarized as all that could be desired,—low grades; good visibility; easy, fast driving; economy of space, for nothing is lost to parking; easy turning radius; great flexibility; all are combined in one ramp. At first glance, a ramp of this system, which is rather hard to grasp and visualize, might seem expensive to build. On the contrary, because of the fact that grades are low, floors, though pitched, are parallel, and there are no sharp curves, it costs little more than ordinary floor construction when once under way. It is possible also to contrive very creditable elevations for such a building in spite of staggered and pitched floors. This, then, outlines the present development of garage ramp systems. It is not meant that any one system is advocated for general use everywhere. Each individual building is a problem in itself, which must be studied and analyzed to determine what type will best fulfill the requirements under the conditions.

As a matter of interest, authentic cost figures are herewith presented, based upon a garage recently built using this last described system. The structure is 90 feet by 172 feet, five stories high, but figured for four more; it has face brick on three sides, and was designed for a net live load of 150 pounds. The cost complete, including heating plant, plumbing, push-button passenger elevator, wiring, fixtures, air compressors, architect's and patent fees, was \$220,000. This figure includes a cost of \$32,000 for concrete piling. This is extraordinarily low, especially in view of the prevailing rates of wages,—common labor 80 cents; carpenter labor, \$1.50; brick masons, \$1.75. It will be observed that the cost per square foot was under \$3. It should be noted that the cost per square foot was thus moderate, or, expressed in terms of cubage, was 22 cents per cubic foot. Located in the business district of a large city in the eastern section of the country, this garage is rated at 430-car capacity. Cars can easily be driven at a speed of 30 miles per hour on grades varying



Section Through a Warped Floor Garage

from about 4 to 11 per cent. The lower two story heights are 12 feet, 8 inches, being designed for the accommodation of trucks, while the upper three stories for the parking of passenger vehicles, are 10 feet, 8 inches high. The total area available for parking on the five floors and roof is approximately 77,400 square feet. The basement is utilized as a repair shop, washrack, etc., and for the heating plant. At the present time this garage is operating successfully with a charge of 50 cents a day for transients and proportionate weekly and monthly rates.

There is a third classification of ramps, worthy of mention,—namely, the combination of the straight run with some form of the curved. This kind is used where insufficient distance is available for a plain straight ramp, and most commonly found in garages of two or three stories only. All of the types here described may be further sub-divided into single or double ramps, that is to say, ramps carrying traffic up or down, or both up and down. The majority of ramps are to carry the double traffic, this in the interest of economy; yet there are single-traffic ramps, and there are advantages to be derived

from their use. Generally speaking, their place is in a garage of very large proportions, having separate entrances and exits in different parts of the building.

Before making final selection of the ramp for any garage, some consideration must be directed to the physical character of the building itself, as dictated by conditions or by the owner. For example, the desired story heights must be decided, generally from 10 feet up; the spacing of supporting columns; the width of driving aisles, 18 to 22 feet suggested; the kind of construction, whether beam and girder or flat-slab; and the treatment of the exteriors. All have some bearing on the ramp problem, as can be readily appreciated. Hence it is that the planning of a modern reinforced concrete ramp garage is something more than just another commission. The need of buildings for this purpose is very real, and many must be built in the next years. Their designing and planning constitute an interesting problem worthy of the best thought and effort, and the attempt has been made in this article to indicate the extent of the available material from which a happy solution can be worked out.



Building a Warped Floor Garage

THE BUILDING SITUATION

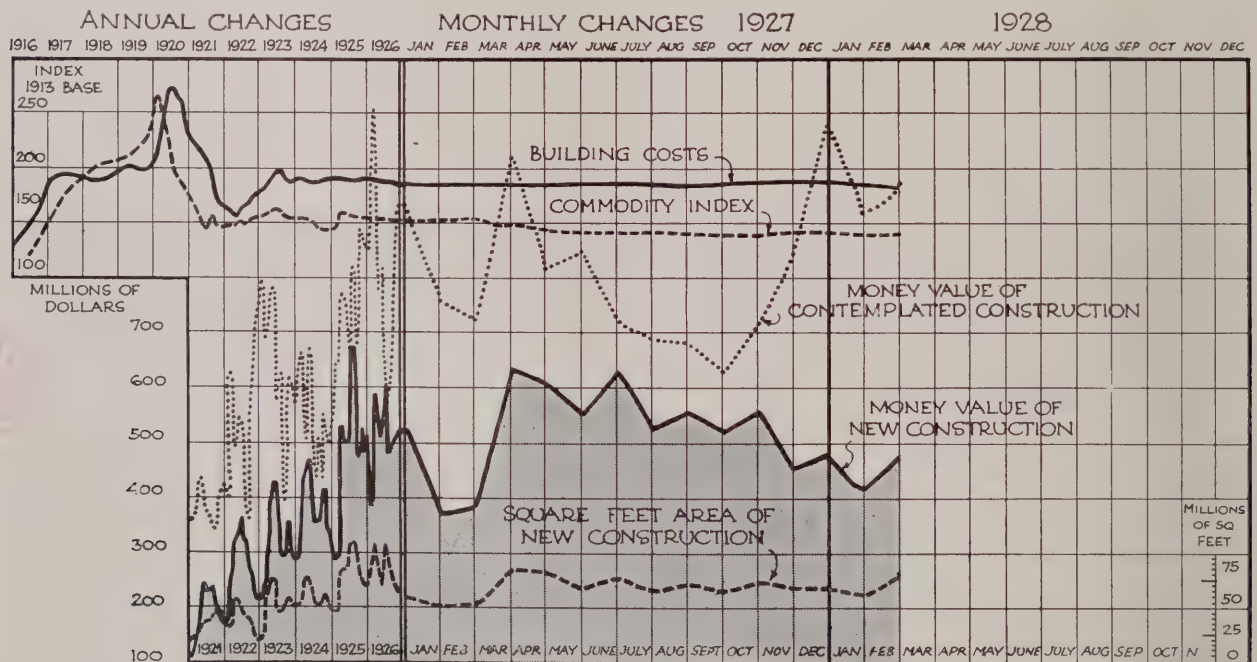
A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE construction figures recorded for the month of February are unusually interesting, because once again all records are broken. According to the figures of the F. W. Dodge Corporation, the value of building and engineering contracts awarded during the month of February in the 37 states east of the Rocky Mountains amounted to \$465,331,300. The figure was the highest February contract total ever recorded for the 37 states. It was 9 per cent ahead of the January, 1928 total and was 18 per cent over the record for February of last year. The territory covered by this record includes approximately 91 per cent of the active building district of the country. Four districts made new high totals for the month of February, the new records being reached by New York state and northern New Jersey, the Middle Atlantic States, the Central West, and Texas. The New England States had a total which was next to the largest February on record.

Last month's contract total for the 37 states included these items of note: \$238,985,100, or 51 per cent of all construction, for residential structures; \$59,980,200, or 13 per cent, for public works and utilities; \$57,695,400, or 12 per cent, for commercial buildings; \$35,413,700, or 8 per cent, for social and

recreational projects; and \$34,881,300, or 7 per cent, for industrial buildings. The February contract total brought the amount of work started since the first of this year up to \$892,500,000, this being a gain of 15 per cent over the amount started in the first two months of 1927. New work contemplated during the past month in these states amounted in value to \$947,003,400. This figure shows an increase of 5 per cent over the amount reported in the preceding month and was 50 per cent ahead of the amount reported in February, 1927. In New York state and northern New Jersey, the value of building and engineering contracts awarded in the month of February reached the highest February contract total ever recorded, the amount being \$139,071,700. This amount is 34 per cent higher than that reported in February of last year and 6 per cent higher than the figure of the previous month. It is to be noted, however, that one hotel project alone, costing \$22,000,000, helped considerably to swell this total.

Of the total amount of construction recorded for February, approximately 51 per cent was for residential structures, which include houses, apartment buildings, hotels, etc. An unusual amount of residential building seems to be under way.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs*. This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index*. Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction*. Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record*. (4) *Money Value of New Construction*. Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction*. The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

QUESTIONS THE ARCHITECT MUST ANSWER ABOUT OIL BURNING

BY

P. E. FANSLER

ASSOCIATE EDITOR, THE HEATING AND VENTILATING MAGAZINE

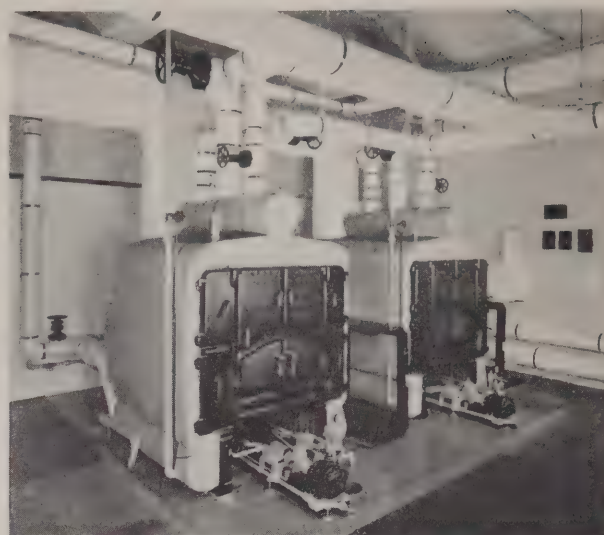
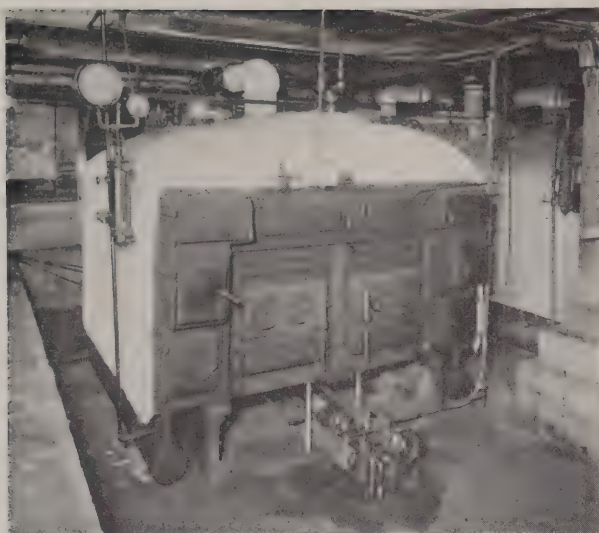
NO fewer than 700,000 domestic oil burners would have been sold during the last 24 months had one been installed in each new house built during that period. It might fairly be assumed that, indirectly at least, architects, through the heating engineers who are responsible for laying out heating plants, exercise a large degree of control over the possible expenditure of some \$150,000,000 a year for oil burners. Having in mind these significant figures, it would seem highly desirable that the architect be well informed regarding domestic oil burners, in order that he may answer intelligently the questions asked by his clients. In a previous article the essential technical features of modern oil burners were described. It is now in order to deal with the most commonly asked questions, and to suggest logical and comprehensive replies.

First of all the architect probably will be asked for his opinion of the value of oil burners as a generic class of equipment. Personal feeling, even if it be strongly for or against, should here be subordinated to facts based on nation-wide performance. As a general thing, architects are lukewarm on this subject, but with a leaning toward giving qualified recommendation. So many burners have been installed in almost every community, and the average results have been so satisfactory, that the architect usually has many more friends who are delighted with the operation of their oil burners than friends who are not satisfied. The aggregate opinion of 25 or more users in any community may be a safe basis of judgment, but if the opinions are based on the performance of only two or three makes of burners, certain reservations may be necessary. So much depends upon the care with which an oil burner is installed that a careless agent can easily ruin the reputation of a first class burner in his territory. I know of a case where a prominent western architect was involved in a very disagreeable situation by the installation of two burners in a single boiler. The agent realized that he did not have a suitable burner for this installation, but, rather than let a competitor get the business, he resorted to the subterfuge of putting in two burners where one of greater capacity should have been used. Throughout a winter season the owner, the architect and the agent formed a constantly wrangling trio. Finally the two burners were removed by a competing agent, a larger and more suitable type of burner was put in, and, immediately, peace reigned. The architect was justified in his recommendation of oil burning, and the owner was converted into an enthusiastic booster. In this case, had the architect been better informed on the technique of oil burning, he would not have approved the proposal of the original agent.

In my contacts with the heating industry, I have found rather more reluctance to accept the oil burner than I have among architects. One man, prominent in the industry, was vehement in denouncing "the oil-burner business" because two of his friends, heating contractors, had lost considerable money through taking on an oil-burner agency. It would seem logical to suggest that the difficulty might have come as the result of bad merchandising rather than of defective or unsatisfactory merchandise. The architect, in reading advertising, and in discussing such advertisements with his client, should strip the superlatives and exaggerations from the meat, and assure his listener that no burner is "absolutely" safe, any more than a coal-heating plant or a gas-heating plant, or an automobile is "absolutely" safe. He must admit that every burner using an electric motor, and many of the atmospheric burners, make some noise, although properly installed burners should not be audible in the living portions of the home. He might quizzically raise the question, where burners are claimed to be "perfected," as to the necessity for spending money in laboratory work if the burner is already perfect.

But the conscientious architect is bound to tell his client that oil burning in the home is, broadly speaking, entirely successful, and that every factor militating against universal satisfaction is being studied and remedied as rapidly as possible. One of the most general causes for trouble in domestic burner operation has been unsuitable or non-uniform fuel. This situation is rapidly being cleared up by the oil refiners, who see a tremendous market for partially refined products. A great many bitter experiences during the last few years have proved the necessity for close adherence to definite specifications, and all interested parties are now working on a formulation of such specifications as will remove this serious cause of trouble.

Assuming that the architect is ready to recommend oil burning, he probably will be faced with the question: "What is the best burner?" This can be answered with entire fairness and satisfaction to all concerned by recommending the three or four burners that have given the greatest general satisfaction in the neighborhood. Suggest to the client that he call on owners and get first-hand data on a few of the burners most popular in his locality. Burner performance being a combined function of the burner and of the operations of the agent, this method of selection helps to build up the business of the most conscientious burner agents and automatically assists in the decline of the fly-by-night. The selection of a burner is usually determined to some extent by the amount the client is willing to spend for it. The



Cleanliness of Boiler Rooms is Evidenced in These Workmanlike Oil Burning Installations

range in price of burners to supply heat for an eight-to ten-room house is just about what it is for an automobile to transport two persons. One can buy the new Elizabeth, or, by spending 20 times as much, acquire an English-built Rolls-Royce. In general, the trend of prices is downward,—that is, new makes and small and simplified burners made by older manufacturers are now on the market at \$300 to \$400 installed, with 275-gallon inside tanks. Burners suitable for larger houses, installed in cities with extremely rigorous installation regulations, cost up to \$1200.

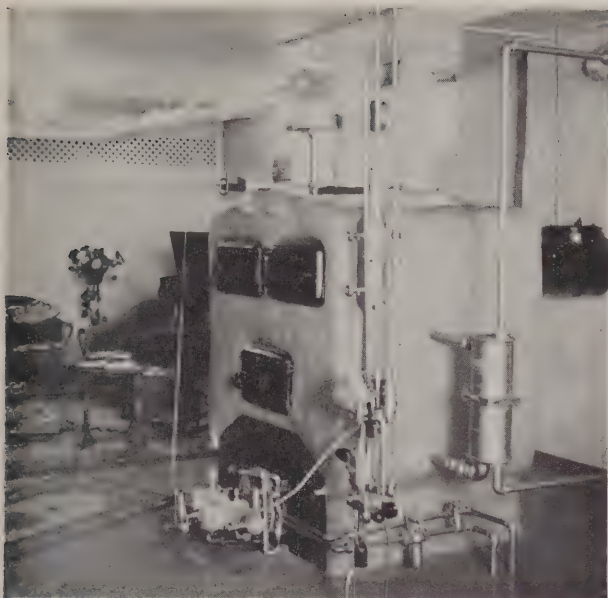
Many clients, in certain sections, and owners of small houses in other sections, will ask: "Will an oil burner be satisfactory in a warm-air heating system?" As a usual thing, extreme care must be taken in installing an oil burner in a warm-air furnace, because this type of heating plant is likely to act as a resonator and amplify and pass on any noise of combustion or mechanical noise of the burner. The air ducts offer an excellent means of transmitting this noise throughout the house. So the burner should be set on a cork or similar foundation, and if possible kept from metallic contact with the furnace. In some cases it may even be necessary to encase the burner unit with sheets of cork or other sound-deadening material; except in extreme cases, a burner can be so installed in a warm-air furnace as to be entirely satisfactory from the standpoint of noiselessness. I would suggest, however, that oil burners should be used only with the new type of all-steel furnaces having welded seams. In the old fashioned kinds, the fire pot is made up from several cast iron sections, the joints being cemented. The intense heat from the burner flame is likely to cause the cement to disintegrate, with the result that products of combustion are drawn into the jacket and spread through the house.

An oil burner should work well with any kind of a heating plant, but there are many factors that may

cause its functioning to be "jumpy" or erratic. For instance, the ratio of the quantity of water in a boiler to the quantity in the radiators and piping can vary within wide limits, and likewise the action of the burner, in response to the thermostat, may vary. Again, the fact that there is liberal radiation in a house, or that it is deficient in radiation, or that it has excessive infiltration may have a noticeable effect on the proper setting of a burner, and on its working. And to these variables must be added those based upon the variations in steam and vacuum systems, with different degrees of "acceleration" in passing heat from the boiler to the air in the rooms. Any of the reliable burners can be so installed as to give entire satisfaction in any kind of a system, but the setting of the burner must be intelligently determined to best suit the specific conditions encountered.

There is one tremendous advantage offered through the use of either oil or gas fuel,—the ability to utilize a large portion of the basement for living or recreation purposes. This is not a fictitious advantage, for houses are now being designed and built in which all but a tiny portion of the excavated portion is to be play room, billiard room, study, or other useful adjunct to the up-stairs portion. Sixty square feet of floor space is sufficient to allow for a boiler and burner, and this is but a fraction of the area of an ordinary basement. The space gained through burning fluid fuel is not merely that saved from the no-longer-needed coal bin; it results from the cleanliness inherent in the basement where fuel is fed automatically through a pipe. A growing number of plans have taken full advantage of this situation, and added approximately 30 per cent of usable space to the houses at no cost but that of decoration.

One question that the architect can count on being asked is "Is there enough oil in sight to justify the investment in a burner?" A near-panic was precipitated by the report of a federal commission about a



Boiler Rooms Equipped with Oil Burners Can Become Part of the Living Quarters of the House

year ago, indicating a shortage of oil, and a great deal of "explaining" followed. As a matter of fact, no one has any conception of the aggregate crude oil resources of the United States, or any other country. Several years ago experts announced what the oil reserve was supposed to be. In the interim more oil than this estimated reserve contemplated has been brought to the surface, and the known bulk of oil is now greater than it was at the time when this statement was issued. Only last month a report was given out leading us to believe that the hidden supply of oil is much greater than ever has been dreamed of, and certainly it is not likely to be consumed for many years to come.

It is my feeling that the consumption of gasoline by automobiles will not materially increase. The ton-mileage of trucking is bound to grow enormously, but the truck of the near future will not burn gasoline,—it will be powered with a Diesel engine using distillates ranging between 24° and 36° A.P.I. The change from use of gasoline engines to heavy-oil engines for marine purposes has already gone a long way toward the ultimate, and except for engines of small power and those of high speed used for special purposes, the marine gasoline business is on the down grade. All this means that gasoline consumption will not grow in proportion to the increase in aggregate automobile horsepower, and that the increased need for "cracking," so marked during the last few years, will not be felt in the future. "Cracking" is the term used in the oil industry to designate the refining of crude oil into lighter oils or gasoline. These cracking stocks will then become available as domestic fuel, adding enormously to our present stocks.

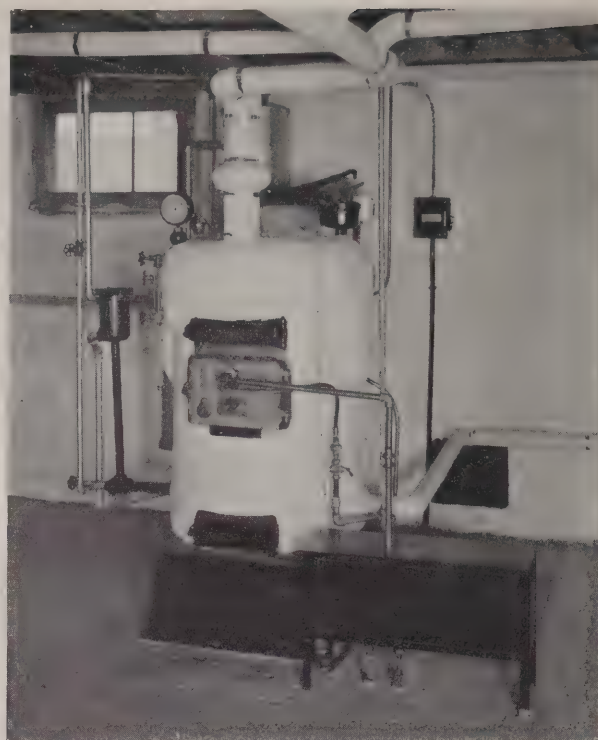
"How much oil capacity should be installed with an oil burner?" is a frequently asked question. This is largely a matter of local conditions,—proximity to oil stations, promptness of service rendered, con-

dition of roads, and normal character of the winter weather. Usually there is such a small difference between the cost of an installation with a 275-gallon basement tank and one with a 1000-gallon outside tank, that it would be good insurance to put in the latter. In many sections of the country it is common practice to install tanks above the surface of the ground and to cover them with neat housing, or to allow vines to run over them. This reduces the cost of installation, but this practice would not be tolerated east of the Mississippi River. If a burner is installed in a house where oil trucks constantly pass within a few blocks, a small tank will suffice, particularly if the service is good. I would recommend, however, getting away from basement tanks and using only 1000-gallon and larger buried tanks, merely as a good investment in fuel storage and reserve. The average house may require 200 gallons of fuel per heating season, and for such a building a 1000-gallon tank would be about right.

There is one question that is always asked in a discussion of oil burning: "How does oil heat compare in cost with heat from a coal-fired plant?" The only proper answer to this query is that there is no proper comparison. Solid fuel gives one kind of a result; fluid fuels,—oil, gas or district steam,—give an entirely different kind of "heat comfort." Logically, the costs should not be compared. No one, after having used a decent oil burner, or a gas-fired heating plant, or "street steam" would attempt to compare them with a coal-fired plant. He would say: "I'm getting real heating comfort of a kind I had never known. My fuel is automatically fed, thermostatically controlled, so that the temperature in my house is always just what I want it, and there is no dirt, no dust and no residue to remove. Cost comparison is out of the question." Two years ago I sent a circular letter to a number of persons who had



A Separate Oil Fired Hot Water Heater



An Indirect Hot Water Heater

used oil burners for two or more years,—they had had experience. I asked them, among other questions, how much more they would pay for oil fuel than for coal before they would revert to coal. The figures given in the replies varied between 25 and 200 per cent, and the mean was almost exactly 100 per cent. In other words, the average man was willing to pay twice as much for oil heat as for coal heat.

In a recent article, Dr. R. T. Haslam, of the Standard Oil Development Co., a leading technician on the subject of the utilization of fuels, said that a high class burner of the present day, properly installed and adjusted, should produce heat at a cost not exceeding that of equivalent heat produced by burning anthracite coal. Of course, this is a general statement, but it is unbiased and authoritative. I would say that equivalent heating should be produced by oil fuel at costs varying between 10 per cent less than and 25 per cent more than those for coal in the same territory. As a general thing oil burners are not removed. Once in a while we learn of a locality where burner removals cause considerable comment. Two causes usually explain the situation. Either a salesman has "cleaned up" in a given locality, with a cheap burner that is not worthy of the name, or a really good burner has been damned through the high-pressure, careless installation policy of a "get-rich-quick" type of agent.

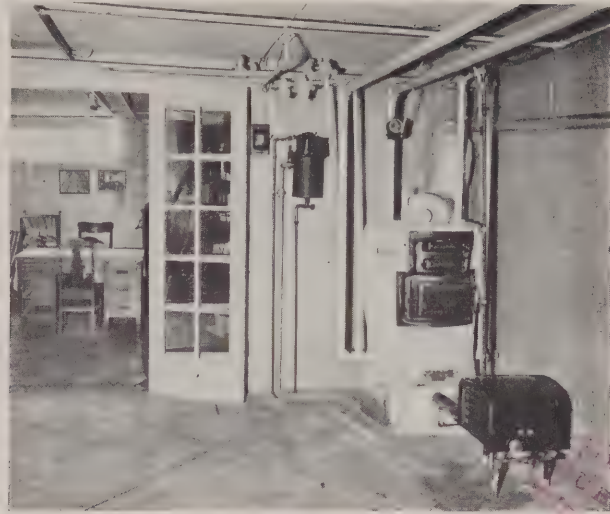
The life of a good burner is not known. Burners built on the Pacific coast and installed more than 20 years ago are still in service. Some of these are about as efficient as the modern units, although not automatic in operation. A high class burner heating

a house for the first time this winter should give ten years of heating comfort without major repairs. It might be well to overhaul twice during that period. If kept free from dirt and dust and properly lubricated, there is little to wear out and require replacing. I should expect any one of the dozen burners that I might select for my own house to serve me well for at least 15 years, and I am certain that any one of them would be able, mechanically, to do so. The life of underground tanks is not known, but, based on installations made 15 years and more ago, the tanks installed today should last for at least 20 years. Cinders should never be used to fill in around oil-storage tanks, as water seeping through the cinders causes the formation of destructive acids. Special attention should be given to tank installation in those rare locations where corrosion follows the placing of iron in the earth. None of the oil fuels in common use for domestic heating will freeze in the coldest winter weather, either in buried or in exposed tanks. Some oils will congeal to such an extent as to cause faulty operation of the oil pumps, but where a reputable agent advocates the use of heavy fuel, provision always is made for maintaining the temperature of the oil in the tank and pipe line at such a point that proper viscosity is insured. This is usually done through the medium of a steam or hot water coil connected to the heating plant.

The two problems that loom before the oil-burner manufacturers today are those of proper installation and service. We have discussed the former; the latter is not yet settled. The oil burner is a simple, rugged, yet at the same time delicate mechanism. It



Utilization of Oil Fired Boiler Rooms Without Decorative Modification
Boiler Room as Children's Play Room



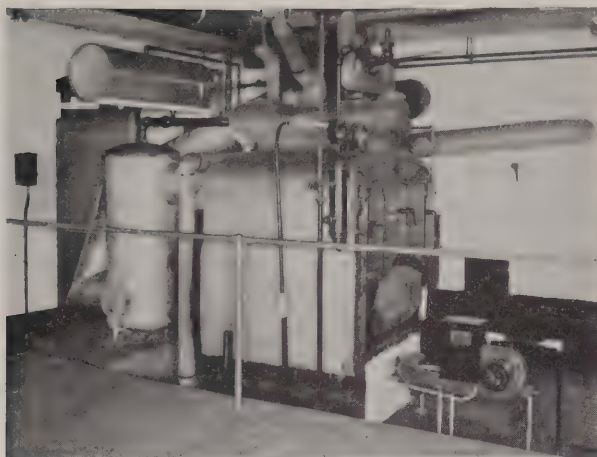
Boiler Room as Adjunct to Study

should not, as a general thing, be played with or adjusted by the average servant. Service should be available at all times, although it may never be needed. To meet this requirement some dealers are providing service free for the first month, or two, or three, and then charging for service at a definite fee per call, by the hour, or for a fixed charge per heating season. In the last case there is included a general overhaul of the burner in the spring, its storage or proper protection from dust during the summer, and a check-inspection at the beginning of the heating season. If a home owner has an appreciation of high class machinery and its abilities and limitations, he may go through an entire heating season without requiring a service call;—many do. On the other hand, if he or the servants are careless and unappreciative, allowing dust and dirt to get to the burner and giving no heed to its operation, such a plant may need cleaning and oiling by a service man once a month. Twenty dollars a year should provide service for the typical good burner in average hands. Present-day charges may exceed this by \$5 or \$10, largely on account of lack of density of population in any community. When there are more burners in use, service charges will naturally drop.

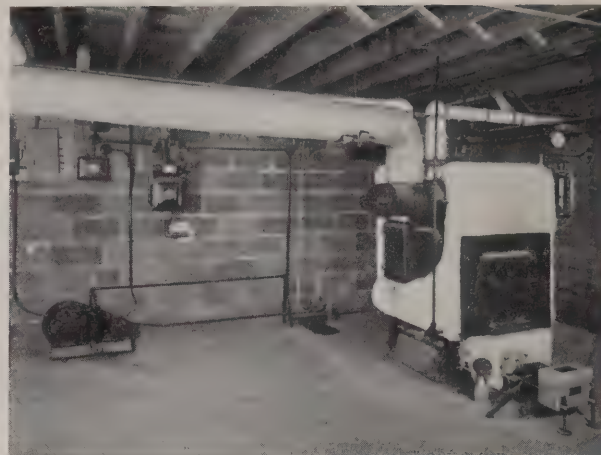
Oil burners are, as a usual thing, delicate in adjustment; that is, a slight variation from a certain setting will materially decrease the efficiency of the burner. This does not mean, however, that burners are unstable. The usual practice is to have air and oil adjustments so made that special keys are required. This prevents tampering with the setting by any other than the authorized and qualified agent. It is not impossible to so adjust a given burner that it will produce heat at a given rate and then make another adjustment that will double the quantity of oil required to generate the same amount of heat at the boiler outlet. This is because it is very easy, when setting the burner by eye, to so adjust it that a tremendous amount of excess air goes through the combustion chamber.

It would be of great benefit to the house owner if every architect required that burners be set on the basis of a gas analysis made with an Orsat apparatus. This might well be made an item in the architect's specifications. This apparatus furnishes exact data on the character of the flue gases, and, with a thermometer giving the flue-gas temperature, it is a simple matter to adjust the burner for maximum efficiency. The cost of making the final adjustment in this exact way would be only a dollar or two more than leaving it to the eye of the installation man, and the results certainly would justify the requirement.

The matter of safety, where oil is the fuel, I have left to the last. Two years and more ago this was a pertinent and often-asked question. Today there is a pretty general understanding of the facts. In this interim the National Board of Fire Underwriters has made a careful study and analysis of oil-burner fires, and the data accumulated indicate that the risk in a house burning oil fuel is no greater than in a house burning anthracite coal, and much less than where soft coal is used. The fact that no additional premium is charged for domestic fire insurance should be conclusive evidence on this point. It is unfortunate that a great many people interested in the sale of coal have undertaken to carry on a terrorist campaign through advertising in local newspapers, using articles about oil-burner fires, set up to resemble news items. One such, in a New Jersey paper, I traced through 14 offices and "news" agencies. Finally the fire chief in the city where the "fire" happened branded the story as a gross exaggeration. Careful installation in accordance with the regulations of the National Board of Fire Underwriters is the best guarantee of safety. Nearly every manufacturer requires that his burners be so installed, and these standards are being adhered to by members of the oil-burner industry, who realize the importance of this phase of their work. The Underwriters' regulations are not in any way over-strict or objectionable, but in some cities the author-



Two Radically Different
Motor, Blower and Nozzle in Single Unit



Types of Oil Burners
Motor Driven Blower Separate from Nozzle Element

ities pass regulations that are unnecessarily harsh. The extra costs involved are always passed on to the purchaser. In New York, for example, it costs about \$200 more to install a high class burner than it does in nearby cities, or even in the other large cities in the country. This premium of 20 per cent does not seem to be offset by evidences of greater immunity from fire.

Finally, there is the question, never omitted: "What burner would you recommend?" First, as to type, there are no data to show that any one type is generally superior to others. There are no data to prove that any shape of flame is more efficient or desirable in all types of boilers than are other shapes. The installation man who knows his business can adapt almost any type of burner to give excellent results in any boiler or furnace that is fit for an oil-burner installation. The long fox-tail flame produced by some burners seems particularly adapted to the long, narrow combustion chambers of sectional cast iron boilers. The same long flame can be utilized in round-type boilers through the proper use of refractory materials. And in the steel boilers that are available for house heating, such a flame fits beautifully;—but the same thing is true of the other shapes of flame, with few exceptions. Proper installation will make any shape show excellent performance in any shape of combustion chamber, provided always that the burner will handle oil at the necessary rate to carry the boiler at the maximum load required. It has been amply demonstrated that the average boiler, particularly the larger steel types, will carry more of an overload with oil fuel than when fired with coal. This is largely because higher temperatures can be maintained in the combustion chamber without variation, and because there is no "firing period." The burner can be set to burn continuously, and the output of the boiler maintained at 150 to 200 per cent of its normal rating. This is one reason why the installation of an oil burner is frequently followed by more satisfactory heating,—the boiler ability is increased with the change in fuel.

A definite warning should be sounded, however,

against attempting to bolster up the operation of a "sick" heating plant by installing an oil burner. Many and many a burner has been sold on the promise that it would heat rooms that never had been comfortable when coal was used. This situation, of course, does not arise in connection with new houses. It is obvious that insufficient heat in any portion of a house is the result of too little radiation, too small piping, improperly run lines, or similar defects. These should be corrected, if it is desired to improve results; the remedy is not merely in a change of fuel.

From a constant and careful study of the development of heating with gas, oil and coal, I feel certain that we are at the beginning of a nation-wide trend toward the use of fluid fuels. Gas and oil are the domestic fuels of the future,—the former where it is available at a reasonable price, and the latter in the tremendous areas where gas is not to be had, or is excessive in cost. Fundamental economic laws will provide for a balancing of unit fuel costs against the relative benefits accruing from the use of each kind. One trait is characteristic of Americans, and it is daily growing more pronounced,—the readiness to pay generously for bodily comfort and for any desired attainment at a minimum expenditure of effort, physical or mental. This explains, in large measure, the ready acceptance of gas and oil as domestic fuels, and the possibility of a complete change from solid to fluid fuels within the space of a dozen or more years. The architect who will best advise his client in this matter will follow the present developments in the burner and fuel industries and judge with unbiased attitude the merits of the case from data gathered in nation-wide studies. Oil-burner manufacturers are banded together in an honest and earnest endeavor to improve their respective mechanisms, to raise the standards of merchandising, installation and servicing, and the oil producing and distributing interests are striving to standardize oil fuels and provide for delivery with minimum effort on the part of the home owner. These activities are so sincere that there is no doubt of early attainment of their aims.

BUSINESS AND FINANCE

THE ARCHITECT AND REALTY DEVELOPMENT

AN INTERVIEW WITH ROBERT TAPPAN, ARCHITECT

BY KENNETH KINGSLEY STOWELL

THE field of speculative building is one which architects seem to have neglected, and yet, when we stop to consider that over a billion dollars are spent each year in the construction of small houses costing less than \$25,000, it would seem to be fertile for the architect's activities. Probably less than 10 per cent of the small houses built in the United States last year were designed by architects. It would hardly do for the architect to merely shake his head and condemn the ugliness of the speculative houses, without making a serious attempt to improve their quality. Is it not a civic duty for the architect as well as an opportunity? The speculative builder needs the services of the architect, and arrangements can be made that will be mutually advantageous, and there will be a large unearned increment for the public at large in more sightly suburbs and in more agreeable and efficient living conditions. Perhaps the situation will be clearer if we draw the analogy between custom tailoring and ready-made. Most people would be glad to wear custom-made clothes if they could afford it, but the large majority, for economic reasons, are forced to use the ready-to-wear. The same is true in housing as in clothing. Most people would prefer to have their houses designed individually for themselves, but the lack of cash forces over 90 per cent to live in "ready-made" houses. Here the analogy falls down, perhaps, as we find the ready-made clothing approaches closely in design the custom-made. The speculative house seldom has the advantage of good design.

The Attitude of the Architect. It may be better

to consider the ways and means by which the architect can help to remedy existing conditions rather than to try to fix blame on either the speculative builder or the architect. The architect cannot hope to coöperate with the speculative builder unless he is willing to analyze the builder's position and to grasp the economic considerations that are always uppermost in the builder's mind. He must realize that the builder is investing a comparatively large amount of money, and that his risk is great. The architect, in connection with a project of this kind, is risking a few hundred dollars, whereas the builder is investing thousands. The architect must be able and willing to consider the whole project from the builder's viewpoint. He must often ask himself the questions, "What would I do if I were in the builder's position?" "What would my reaction be to this if it were put up to me as the builder?" This sympathetic understanding can only be the result of a conscious effort on the part of the architect,—an effort, perhaps, which many architects are unwilling to make. It will mean a sloughing off of any over-bearing propensities or superiority complexes, with which most builders feel that the architect is endowed. It means "playing the game" with the builder. It means the elimination of much that is, to use the vernacular, "high hat." The architect must learn to talk in the language of the builder, in the beginning, and to educate him, as things develop, to the advantages of good design.

The speculative builder rarely considers consulting an architect of merit because he feels that the archi-



General View of Forest Close, Forest Hills, N. Y.

Robert Tappan, Architect

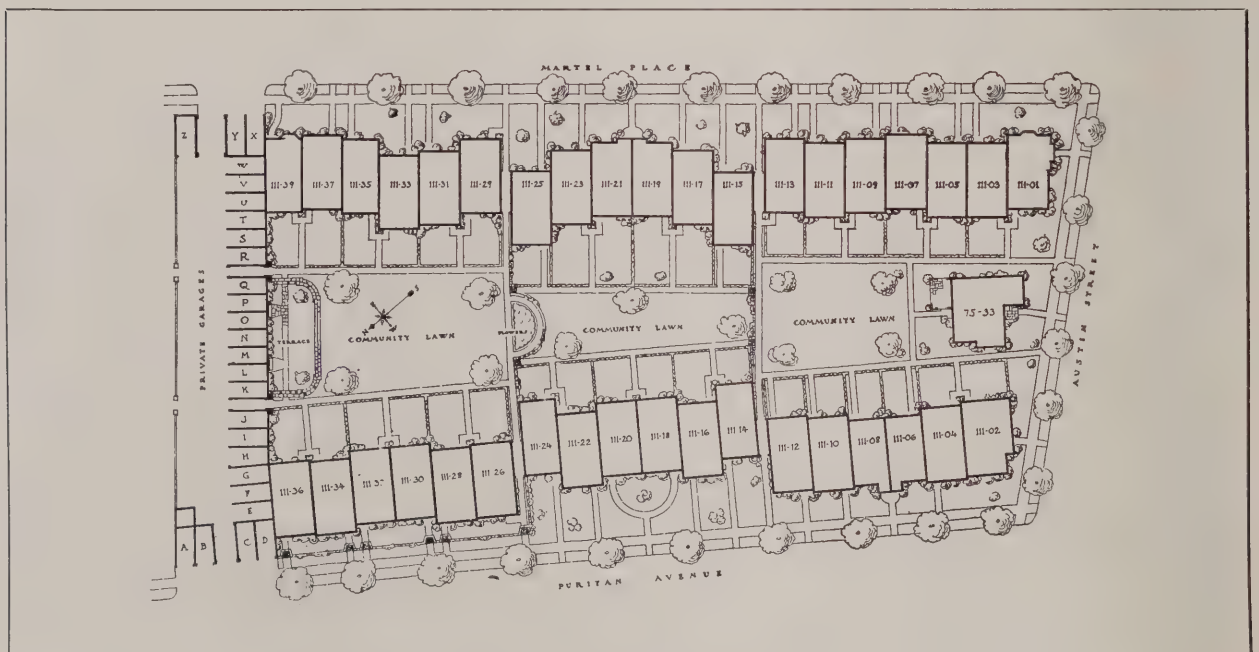


Interesting Grouping and Texture at Forest Close

Robert Tappan, Architect

tect's fee is out of proportion to the service he renders; and he also feels that the architect will, through failure to fully understand the economic aspects of the problem, incorporate expensive features in the designs for speculative houses. Nothing can be done unless the architect is able to convince the specula-

tive builder that he will be able to make his services pay, or more than pay, for themselves, when considering the project as a whole. In other words, the architect's argument must be that he can help the speculative builder to sell his houses faster and for more money because of their good design than would



General Plan of the Development



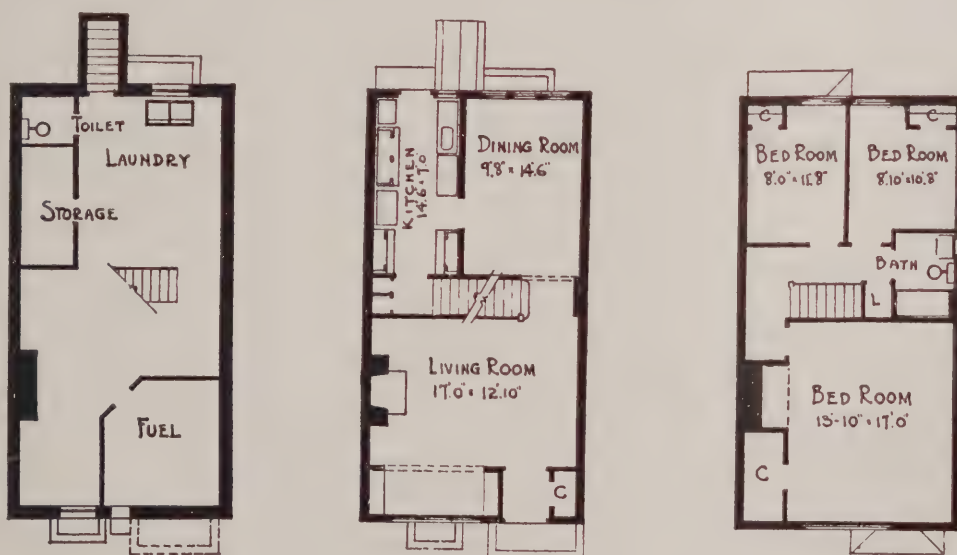
View in the Garden of the "Close"

Robert Tappan, Architect

otherwise be the case. He must also convince the builder that the houses he designs will be no more expensive to build than those produced by someone with less training and experience in architectural design. The architect can help the builder to get larger loans proportionally from the bank for his project

because the designs are attractive to buyers and the materials and workmanship specified by the architect are of a quality that will insure the safety of the investment.

The question for the architect is "How can I convince the speculative builder of the facts just men-



Plan of Houses Each Having Six Rooms and One Bath



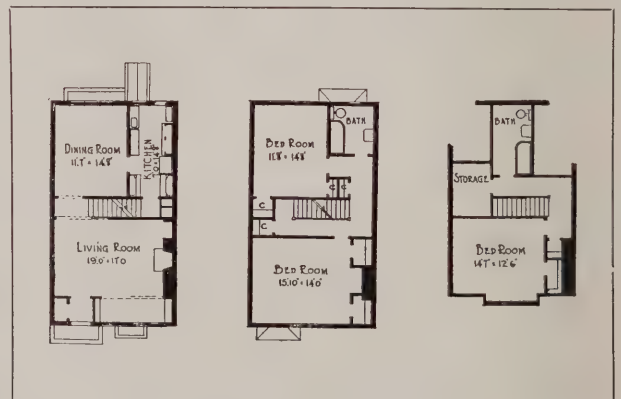
Variations in Exterior Design Add to Attractiveness

tioned?" In the first place, results accomplished are usually the most convincing argument. For that reason, the Forest Close development, at Forest Hills, New York, is given here as one such instance.

In the second place, the architect must be willing to prove his point graphically. He can do this by offering to take the plans that the speculative builder has used on former projects and to make sketches showing how these plans can be altered for greater efficiency, for saving of labor and materials, and, especially, to make the houses more readily salable by excellence and attractiveness in design. This latter method has proved convincing in many cases, and it is satisfying to know that this demonstration of ability has convinced the speculative builder, and he has invariably come back to the architect for each new project. The making of contacts with speculative builders should not be difficult. It would be wise for the architect to consult first the one or two leaders in this field in his locality. He may find these men the most receptive to ideas that will be to their mutual advantage.

The Architect's Fee. Perhaps this, rather than any other consideration, deters speculative builders from employing architects. The much advertised 6 per cent will often scare off the speculative builder who usually pays \$40 or \$50 for a set of blue prints

which he "buys." The flat fee of a certain stipulated sum, based on the architect's past experience, is the best basis on which to charge the speculative builder for architectural service. The percentage and the "cost plus" systems of charges have not been found advantageous for use in this type of work. The architect should insist on supervising the work. Only in this way can he make sure that the results will warrant his employment. He will not be able to make good his claims of greater salability because of attractiveness and quality if he does not have control of the execution of his designs. The supervision is as much a part of his helpful service to the prospective builder as his original design. The architect must be prepared to meet the builder halfway on the question of fee. He must not expect the same size fee for this sort of work as he would expect in working for the client building an individual house. This is entirely compatible with his own business judgment and the ethics of the profession. This type of work requires less effort on the part of the architect in comparison with the amount of money involved, than many other buildings designed for the individual client. The architect is relieved of the necessity of complying with the whims of the client and the constant changes in plan that must be made in connection with the usual small house problems. Having



Plans, Six Room Houses, Each with Two Baths



The Garages are Placed at One End of the "Close"

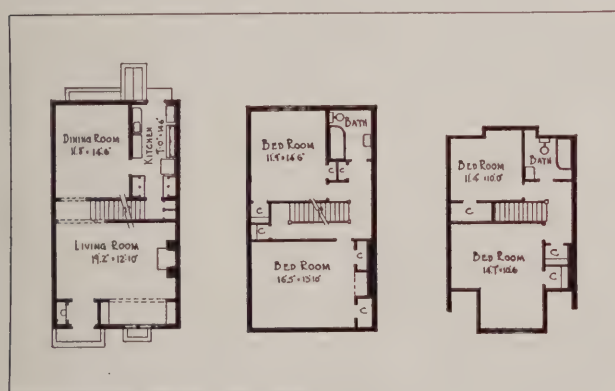
worked out one or two plans for the speculative builder, variation is obtained by alternating these plans and by grouping standard facades in order to make an attractive ensemble.

In determining the requirements of the project, the builder usually has a fairly definite idea of the practical requirements in regard to the number of rooms and the selling price, which largely determines the plan and character of the development. The builder is usually in a better position to set forth these requirements, because he is in direct touch with the buying public, and the architect as a rule has very little knowledge of real estate selling conditions in the locality of the development. The builder's ideas will usually be found sound on these subjects. The architect can, by modifying and rearranging the plan ideas of the builder, produce more attractive and more efficient houses. This is especially true in regard to the grouping and group arrangement. In this connection composition, relation of masses, relation of wall to fenestration, and considerations of texture are much more important than small details. The position of the window in the facade and its relation to the whole composition are much more important than the actual detailing of the window itself and its trim. The architect should take advantage of the builder's knowledge of the most economical de-

tailoring and not be too insistent on special moulding profiles. The architect can select the best of stock designs for their architectural effect without adding to the cost of the building. The builder is usually unable to make as wise a selection, and consequently would produce a poorer looking building if the choice were left to him alone, without the benefit of the training and taste of the architect.

Throughout the entire project every consideration must be given to economy of materials and labor. The builder and architect, working together, can produce buildings worth while architecturally for no greater cost than buildings of like accommodations and size that are lacking in the essentials of good design.

The "community garden" type of development has proved an excellent form of housing venture for the speculative builder. There seems to be an instinctive desire to own a small plot of ground and a single house of one's own. The "community garden" development meets this instinctive desire and yet makes possible the building of homes at a smaller cost than would be involved if each house were separate. The party walls effect a great saving, and the small houses gain in appearance by being incorporated in the design with their neighbors. The houses, though they may be small, do not appear as tiny or as tall as they would if they were constructed separately.



Seven Room House with Two Baths



Eight Room House with Two Baths

As an indication of the quality of construction that the enlightened real estate developer is adopting, we quote here the essentials of the specifications of Forest Close.

FOOTINGS: Solid concrete 12" x 24" under all walls.
 FOUNDATIONS: Solid concrete 12" thick.
 CELLAR FLOOR: Solid concrete 3" thick.
 EXTERIOR WALLS: Brick, laid in Portland cement mortar. Metal pans are set under and over all windows.
 STUCCO: Portland cement, troweled finish.
 STEEP ROOFS: Graduated slate laid over 30-pound roofing felt and fastened with copper nails.
 ROOF DECKS: Ten-year guaranteed tar and gravel roof.
 FLOOR JOISTS: 3" x 10" Douglas fir.
 RAFTERS: 3" x 8" and 2" x 6" Douglas fir.
 PARTITIONS: 2" x 4" spruce, 16" on centers, non-bearing.
 PARTY WALL: Concrete block, 8" thick.
 CELLAR WINDOWS: Steel sash and frames.
 DOUBLE HUNG WINDOWS: White pine.
 EXTERIOR TRIM: Selected white pine.
 LEADERS: 16-ounce copper.
 GUTTERS: 16-ounce copper.
 FLASHING: 16-ounce copper.
 FURRING: All exterior walls furred, for air space.
 LATHING: 24-gauge metal lath throughout.
 PLASTER: Patent plaster, troweled and smooth finish.
 WATER PIPE: Solid brass throughout.
 STEAM BOILER: Latest model round boiler.

WATER HEATER: Automatic gas storage system, with heater connected to furnace.
 PIPE COVERING: Asbestos air cell.
 RADIATORS: Cast iron of approved design.
 AIR VALVES: On all radiators.
 BATH ROOM FIXTURES: Of best quality.
 BATH ROOM WALLS: Tiled to ceiling.
 BATH ROOM FLOOR: Ceramic mosaic tile.
 KITCHEN FLOOR: Cork composition.
 ALL OTHER FLOORS: Select grade oak $\frac{7}{8}$ " thick, laid over sub-floor.
 INTERIOR TRIM: Selected white pine.
 STAIRS: Oak treads, wedged and glued.
 DOORS: Single-panel— $1\frac{3}{4}$ " birch.
 HARDWARE: First quality throughout.
 ELECTRIC WORK: B/X cable for wiring.
 ELECTRIC FIXTURES: Ample base plugs and distinctive selected fixtures.
 PAINTING: All painting is lacquer applied with air brush.
 SHADES: Non-fading linen.
 SCREENS: Copper bronze throughout.
 WEATHER STRIPS: Copper bronze friction strips on all windows and exterior doors.
 GAS RANGE: Furnished with the house.
 KITCHEN CABINET: Steel of most convenient pattern.

The sales policy for houses of this type is also of interest to architect, builder and prospective owner. A part of the purchase plan of the Cord Meyer Development Company for this group is given here.

SIX-ROOM HOUSES					SEVEN-AND EIGHT-ROOM HOUSES				
\$16,100	\$17,100	\$18,200	\$18,800	\$19,600	PRICES	\$20,000	\$20,500	\$21,000	\$22,500
1,610	1,710	1,820	1,880	1,960	Cash	2,000	2,050	2,100	2,250
8,000	8,500	9,100	9,400	9,800	First Mortgage	10,000	10,000	10,500	11,500
6,490	6,890	7,280	7,520	7,840	Second Mortgage	8,000	8,450	8,400	8,750

Estimated Yearly Carrying Charges									
480	510	546	564	588	First Mortgage Interest at 6 Per Cent, Payable Semi-annually	600	600	630	690
Second Mortgage Installment which pays off this Non-callable Mortgage in Ten Years									
888					\$74 per month on \$6,490				
	936				78 " " " 6,890				
		984			82 " " " 7,280				
			1,020		85 " " " 7,520				
				1,056	88 " " " 7,840				
					91 " " " 8,000	1,092			
					95 " " " 8,450		1,140		
					95 " " " 8,400			1,140	
					99 " " " 8,750				1,188

245	254	270	278	289	Taxes, Approximate	297	302	311	332
8	8	9	15	15	Water, Approximate	15	15	15	15
11	12	13	13	13	Fire Insurance, Approximate	14	15	15	16

\$1,632	\$1,720	\$1,822	\$1,890	\$1,961	Total Carrying Charges	\$2,018	\$2,072	\$2,111	\$2,241
649	689	728	752	784	Included in these totals are the average annual reductions of the second mortgage principal; therefore deduct	800	845	840	875
983	1,031	1,094	1,138	1,177	Leaving Total Yearly Net Charges of	1,218	1,227	1,271	1,366

Yearly Charges on a Monthly Basis									
136	143	152	158	164	Total Monthly Cost	168	173	176	187
54	57	61	63	65	The Average Reduction of the Second Mortgage Per Month	67	70	70	73
\$82	\$86	\$91	\$95	\$99	Leaving Net Cost Per Month of	\$101	\$103	\$106	\$114

To purchase a \$1,400 garage adds \$140 to initial cash payment; \$700 to first mortgage; \$560 to second mortgage. Second mortgage monthly payment is thereby increased \$7.

Purchase Plan for Forest Close

ESTIMATING CONSTRUCTION COSTS CONCERNING METHODS ESPECIALLY ADAPTED TO THE ARCHITECT

BY

CLAYTON W. MAYERS
VICE-PRESIDENT, MORTON C. TUTTLE CO.

NEARLY every architect is acquainted all too well with the unpleasantness experienced in completely revising a set of plans and specifications on which bids have been taken and costs found to be prohibitively high. Such an experience is, however, very much more disagreeable when the procedure is necessary in order that the cost of the finished project be kept within a set limit which heretofore the architect had felt certain would be met by the requirements of his design. The fact remains, however, that he has either been too liberal in refinements and ornamental details or,—what is more unfortunate,—embarked on a project the size of which was too large in the first place. Whatever may be the reason for the necessity of cutting down the design, the work which must be done is not only irritating and disagreeable but expensive, in that the process calls for seemingly endless changes to drawings and specifications.

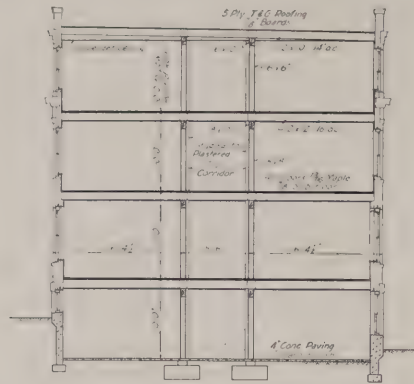
Frequently the result of all this work of revision produces an unbalanced design not at all in keeping with what the architect had originally intended or what the client had expected. Were it not for the pressure of time, making a fresh start might be the wisest way out, but generally the client has already become impatient to begin operations, and now being obliged to forego many of the features incorporated in the original design, becomes more and more disgruntled. Thus the architect is placed in an exceedingly embarrassing position. It is expected that he will be able to make changes quickly which will result in a lowered cost, all without impairing seriously the attractiveness or usefulness of the structure. Eventually the changes in plans and specifications are completed, and as a result, the architect becomes involved with the design and construction of a building very different from his original conception, one in which he can take but small if any pride; in fact, it may be that he would much prefer that he had been disassociated with the project altogether. Perhaps, too, on account of the many hours spent in revising the drawings, the architect finds that he is actually out of pocket, a condition which cannot help but add to the keenness of his disappointment. Much better had he planned a somewhat smaller or more simple structure, a building development in which he could take justifiable pride.

There is a reason for such a state of affairs, and an avoidable reason. A wrong start has been made, and when the start is wrong the course is also wrong, and the result correspondingly unsatisfactory. It may be that the size of the project as originally visualized did not correspond with the amount of funds available for its development. It may be that the

size was correctly established, but that the character of the structure and materials and the elaborateness of the developed details were to blame for the disappointingly high figures submitted by the contractors. Whatever the reason, this unhappy condition could have been averted had the architect given proper consideration to "cost" at the critical time,—namely, during the early stages of the development of the plans.

On this point of cost, the architect, having obtained some generalizations as to what the client could spend, might have made certain mental reservations as a safeguard against surprise, and prepared sketches accordingly. The estimate of cost perhaps consisted of a simple calculation in which the cubic contents of the proposed structure were multiplied by a cost per cubic foot, which represented the best guess of which, at the moment, the designer was capable. Making such an estimate frequently constitutes the sole means of judging cost of the building until the designer's plans have been fully elaborated, his specifications written, and the whole put to the test of competitive bids from a number of contractors. All through this period of designing, there is no certainty that the design will prove capable of development within the limits of cost previously set. There is always a chance, however, that the design may have sufficient appeal to permit an expansion of the limits of cost as set by the client. In such a case, the architect may be more fortunate than skillful!

So many factors enter into the cost of construction work that it is only by making preliminary estimates during the early stages of design that an architect can be reasonably certain that he is on the right road. Such estimates should be the product of a building cost expert working closely with the architect. It is only by such a procedure that the architect is assuring his client of skillful and competent service. Where a building,—whether it is an office structure, a factory, a hotel or a large apartment house,—must return income proportioned to the capital investment which it represents, such procedure alone is intelligent and fair. This cost expert should be a man in close touch with the actual cost of work done in the construction field. He should be working not merely from records, in many instances established by persons and under conditions unfamiliar to him, but from information gained at first hand, which should be extensive enough to permit his qualifying to speak with a certain degree of authority. The architect can depend upon the information so furnished in working out the design of the entire building, from footings to parapet cap. By the judi-

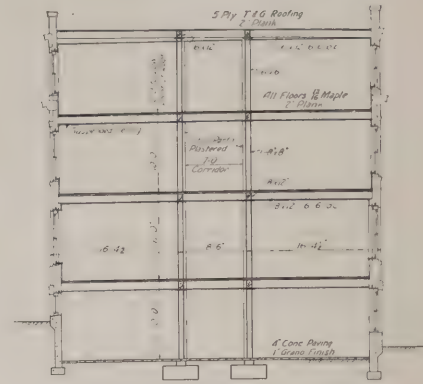


SECTION A
"JOIST CONSTRUCTION"

Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Price per Unit	Cost \$
Concrete Work—			
Interior and exterior footings, including material and labor and plant costs.....	4-1/5 c.y.	15.00	63
Basement walls.....	10 c.y.	15.50	155
Paving (floor on ground).....	6 c.y.	13.25	80
Granolithic finish on paving concrete.....	502 s.f.	.12	60
Steel caps on interior footings..	No. 2		10
Formwork—			
Forms for interior and exterior footings, including labor, material and plant.....	112 s.f.	.30	34
Forms for basement walls including labor, material and plant.....	460 s.f.	.35	161
Reinforcement Steel , including material and labor.....	6/10 tons	92.00	55
Structural Steel lintels, including material and labor.....	1000 lbs.	.06	60
Masonry—			
Brick walls.....	623 c.f.	1.40	872
Hung ceiling of metal lath and plaster.....	225 s.y.	2.50 ✓	562
Plaster on exterior walls, partitions, interior wood columns and girders.....	300 s.y.	1.40 ✓	420
Metal lath on stud partitions..	194 s.y.	.40	78
Carpentry Work—			
Wood furring and grounds in place for metal lath work....			100
Stud partitions (ready for metal lath work).....	872 s.f.	.078	68
Hard pine framing (LLYP) Material and labor of erection.....	1-2/10 M	103.50 ✓	124
Spruce beams, material and labor of erection.....	3-6/10 M	67.00 ✓	241
7/8" sub-flooring and roof boarding, material and labor of erection.....	2-3/10 M	50.00	115
7/8" maple top floors (material delivered at site).....	2 M	90.00	180
Lay maple top floors, including nails and paper.....	15-1/3 sqs.	6.00	92
Cast iron work for framing (bases, caps and anchors)...			50
Nails, spikes, etc., for plank and spruce framing work....			10
Painting walls and ceilings (2 coats).....	246 s.y.	.35	86
5-ply tar and gravel roofing (on wood roof).....	5-1/10 sqs.	15.50	79

Net estimated cost of one bay only..... \$3,755



SECTION B
"MILL CONSTRUCTION"

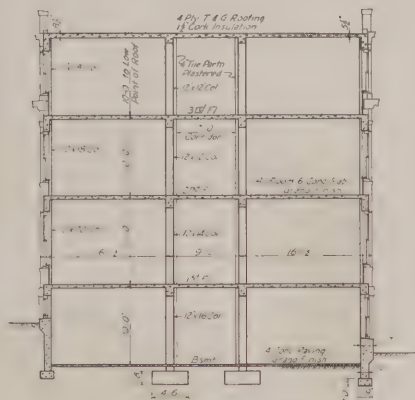
Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Cost per Unit	Cost \$
Concrete Work—			
Interior and exterior footings including material, labor and plant costs.....	4-1/5 c.y.	15.00	63
Basement walls, including material, labor and plant costs..	10 c.y.	15.50	155
Paving (floor on ground).....	6 c.y.	13.25	80
Granolithic finish on paving concrete.....	502 s.f.	.12	60
Steel caps for footings.....	No. 2		10
Formwork—			
Forms for interior and exterior footings including labor, materials and plant costs.....	112 s.f.	.30	34
Forms for basement walls.....	460 s.f.	.35	161
Reinforcement Steel	6/10 ton	92.00	55
Structural Steel lintels.....	1000 lbs.	.06	60
Masonry—			
Brick walls.....	623 c.f.	1.40	872
Hung ceilings of metal lath and plaster (metal hangers)....	225 s.y.	2.80 ✓	630
Plastering on exterior walls, partitions, wood columns and girders.....	277 s.y.	1.40	388
Metal lath on stud partitions..	194 s.y.	.40	78
Carpentry Work—			
Wood furring and grounds in place for metal lath work...			100
Stud partitions ready for metal lath.....	872 s.f.	.078	68
Hard pine framing (LLYP)...	2-6/10 M	103.50	269
Short leaf spruce plank for sub-floors and roof.....	4-7/10 M	53.00	249
Maple top floors (material delivered at site).....	2 M	90.00	180
Lay maple top floor, including nails and paper.....	15-1/3 sqs.	6.00	92
Cast iron work for mill construction framing.....			100
Nails and spikes for plank....			15
Painting walls and ceilings (2 coats).....	223 s.y.	.35	78
5-ply tar and gravel roofing...	5-1/10 sqs.	15.50	79

Net estimated cost of one bay only..... \$3,876

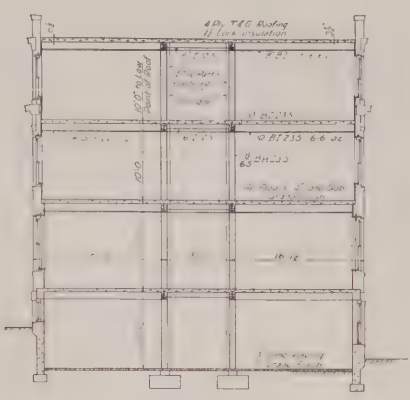
cious use of such information he should at no time be ignorant of the proper cost of the structure being developed. A budget estimate of cost should be made, which,—instead of being a guess predicated on a hasty calculation of probable cubic contents,—represents a reasonably careful computation of the cost of each major element in the proposed structure and a totaling of them all. An alteration in the character or form of any one of these elements will, obviously, alter the total cost. Hence, with his building

problem thus broken up into logical and understandable elements, the architect is in a position to view his alternatives on the basis of good reason and to determine whether additional expense is in any way or at any time justified, or whether exactly the opposite viewpoint must be taken in safeguarding the client's interests. Uncertainty of cost should be as far as possible eliminated, thereby saving the architect the unhappy experience previously described, and this can be done by the construction cost expert.



SECTION C
"ALL REINFORCED CONCRETE"

Floor Area	2,145 square feet		
Cube	22,255 cubic feet		
	Quantity	Cost per Unit	Cost \$
Concrete Work—			
Concrete interior and exterior footings (including materials, labor and plant expense)..	4-2/10 c.y.	14.00	59
Basement walls (including materials, labor and plant expense)	10 c.y.	14.50	145
Paving on the ground (1-2 1/4-5 mix)	6 c.y.	12.25	74
Floor slabs and beams	54-2/10 c.y.	15.00	813
Granolithic finish	2022 s.f.	.10	202
Formwork—			
Interior and exterior footings..	112 s.f.	.30	34
Basement walls	460 s.f.	.35	161
Floor slabs and beams	2555 s.f.	.25	639
Exterior and interior columns (very small)	625 s.f.	.40	250
Reinforcement (steel)	6-8/10 tons	90.00	612
Steel Lintels (angles)	75 ft.	.70	52
Masonry—			
Brickwork (walls & face work)	369 c.f.	1.50	554
4" t.c. partitions at corridors	847 s.f.	.25	212
Plastering walls and ceilings (on masonry)	272 s.y.	1.40	381
Wood furring and grounds (in masonry)			160
Painting walls and ceilings (2 coats)	272 s.y.	.35	95
4-ply tar and gravel roofing (on concrete slab)	5-1/10 sqs.	14.00	71
1 1/2" cork insulation on roof..			92
Net estimated cost of one bay.....			\$4,606



SECTION D
"STEEL FRAME FIREPROOFED WITH CONCRETE SLABS"

Floor Area	2,145 square feet		
Cube	22,255 cubic feet		
	Quantity	Cost per Unit	Cost \$
Concrete Work—			
Concrete interior and exterior footings	4-2/10 c.y.	14.00	59
Basement walls	10 c.y.	14.50	145
Paving on the ground.....	6 c.y.	12.25	74
Concrete slabs and fireproofing beams and columns.....	39-5/6 c.y.	15.00	598
Granolithic finish	2020 s.f.	.10	202
Formwork—			
Interior and exterior footings..	112 s.f.	.30	34
Basement walls	460 s.f.	.35	161
Slabs and beams.....	2802 s.f.	.22	616
Walls beams	91 s.f.	.30	27
Columns (small)	278 s.f.	.40	111
Reinforcement Steel including material and labor.....	4140 lbs.	.04 1/2	186
Steel lintels (angles).....	707 lbs.	.06	42
Masonry—			
Brick walls and facing.....	534 c.f.	1.50	801
4" terra cotta partitions at corridors	867 s.f.	.25	217
Plastering on masonry walls and columns	98 s.y.	1.40	137
Hung ceilings of metal lath and plaster with hangers.....	169 s.y.	3.50	593
Wood furring and grounds (in masonry)			160
Structural steel framing including labor and materials.....	6 tons	100.00	600
Allow for labor and materials to support outside ends of steel beams until brick piers are in place			50
Mesh for wrapping steel beams before concrete is placed around flanges	1678 s.f.	.04	67
Painting walls and ceilings (2 coats)	267 s.y.	.35	94
4-ply tar and gravel roofing on concrete slab	5-1/10 sqs.	14.00	71
1 1/2" cork insulation on roof....			92
Net estimated cost of one bay only.....			\$5,136

Answering the question as to why the architect cannot get his good friend Mason, the contractor, to give him estimates such as we have furnished here, I believe in the majority of cases where architects ask builders for estimates of this sort that the builder is more interested in making an impression upon the architect than he is in giving the architect his unbiased judgment. To most builders an opportunity to make such an estimate for an architect offers an opportunity to sell the architect the idea that he, the builder, must be tremendously economical in his work. To drive this idea home he is often likely to make very low approximate estimates which, of course, are misleading. Again, few builders have gone to the trouble and expense of compiling statistics on the efficiency of men on various operations.

To make such a compilation requires, first, a large volume of construction work, and also a very efficient cost keeping system on the site in order that such data be available. We believe it is quite customary for concerns who have a large amount of estimating data to guard it very carefully. Free estimates are usually looked upon by architects as being nearly worthless and very likely to be confusing on account of their lack of frankness.

An actual example of the successful results obtained by coöperation between the cost expert and the architect is the best proof of the advisability and feasibility of adopting this arrangement. Therefore, we here describe the working out of an actual case that was most gratifying to all concerned. The construction of the building was carried out at a cost

well within the appropriation made by the client after a study of the preliminary sketches. Preferences, which could be classed as generalities, were expressed by the client, who also furnished the architect a minute description of the utilitarian characteristics expected of the building. Beyond this, the architect was left a wide latitude in the working out of the preliminary sketches of the structure. Fireproof building by no means prevailed in the community where this structure was to be erected. Consequently, the question of second-class construction was brought up. The value of a fireproof building was unquestionably recognized, but at the same time, the client, operating well within his rights, wished to know how much more he would be paying for this more modern type of construction. It was possible indeed that this added cost might have considerable bearing on the enterprise from an investment standpoint. In order that the architect might answer this question correctly, it was necessary to prepare brief comparative estimates, which in turn demanded comparative sketches of the typical cross-sections of the several types of construction available.

Accordingly, outline drawings of these cross-sections were made to which the dimensions and sizes of the major elements were added. Facsimiles of these cross-sections are reproduced here. Comparative estimates of cost based on each of these cross-sections were made, and in doing so items of work common to all schemes were purposely omitted. The tabulated result indicated the comparative costs of one bay of the building, 13 feet in length, consideration being given only to elements which underwent change in the various schemes. From these comparative estimates there was determined the total cost for each type of construction, and the architect and the client were able to select intelligently the scheme which should be incorporated in the plans.

The sketches which show cross-sections A, B, C and D were estimated in detail, considering only those items which were changed on account of the change in type of design. For instance, as these estimates were prepared for the purpose of making comparisons, it was not necessary to consider window sash, as the window sash would be the same in all four schemes. The roof, however, was considered, inasmuch as on a concrete roof only four plies of felt were required, whereas on a wood roof, five plies would be required to make an equally satisfactory roof covering. Painting was considered in all four schemes, as the areas to be painted increased where girders dropped below the ceiling line. It will be understood from this description that in preparing these comparative estimates, as they are called, it was not necessary to go into the items which we consider as common to all schemes.

The architect next produced sketch plans, showing a side elevation, and floor plans indicating partition layouts, and other preliminaries necessary to the compilation of a complete preliminary estimate in which all items of work should be assigned a

proper probable cost, and which at the same time would furnish the client with sufficient and satisfactory assurance regarding the appearance and utility of the building. The estimate made from these last sketches (in which the reinforced concrete frame shown by cross-section "C" was used) has been produced here in detail, and clearly indicates what might be expected as a proper cost of the building carried out on the basis of the preliminary sketches and specifications. With an estimate at hand made in this manner, during the early stages of the work, appropriations may be more intelligently reviewed with a feeling of security to both architect and client.

Description of Office Building

The building on which this estimate is based is an office structure of modified Georgian architecture, of brick, three stories high, with a basement in which an assembly hall is located. The foundation walls of the building are of concrete carried up to the level of the first floor. The brick are of a deep red color, laid up in a manner to present the appearance of an early American bond in which alternate courses of headers and stretchers are used, laid more or less irregularly. Double-hung wood sash about 4 feet wide of Colonial design are used in all the window openings, there being two windows to a bay. The entire structural frame of the building is of reinforced concrete, with no beams spanning across the building except those in the end walls. Reinforced concrete slabs span across the building extending from the side walls to the longitudinal beams which run lengthwise of the building and are located over the main corridor walls. The ceilings in the offices are, therefore, entirely free from beam construction, making it possible to re-locate partitions at any time without considering ceiling beams or suspended plastered ceilings. The inside of the brick walls, except in the basement, were first waterproofed with an asphalt compound, then furred with 2-inch terra cotta split furring. The plaster was applied directly to the terra cotta furring and to the concrete ceilings, the latter requiring the usual bonding coat. The jambs around all window openings were plastered, wood trim being omitted entirely in connection with these openings. The doors, generally, were wood of Colonial design, set in pressed steel door frames and trim. Wood baseboards and picture mouldings were installed in most of the rooms.

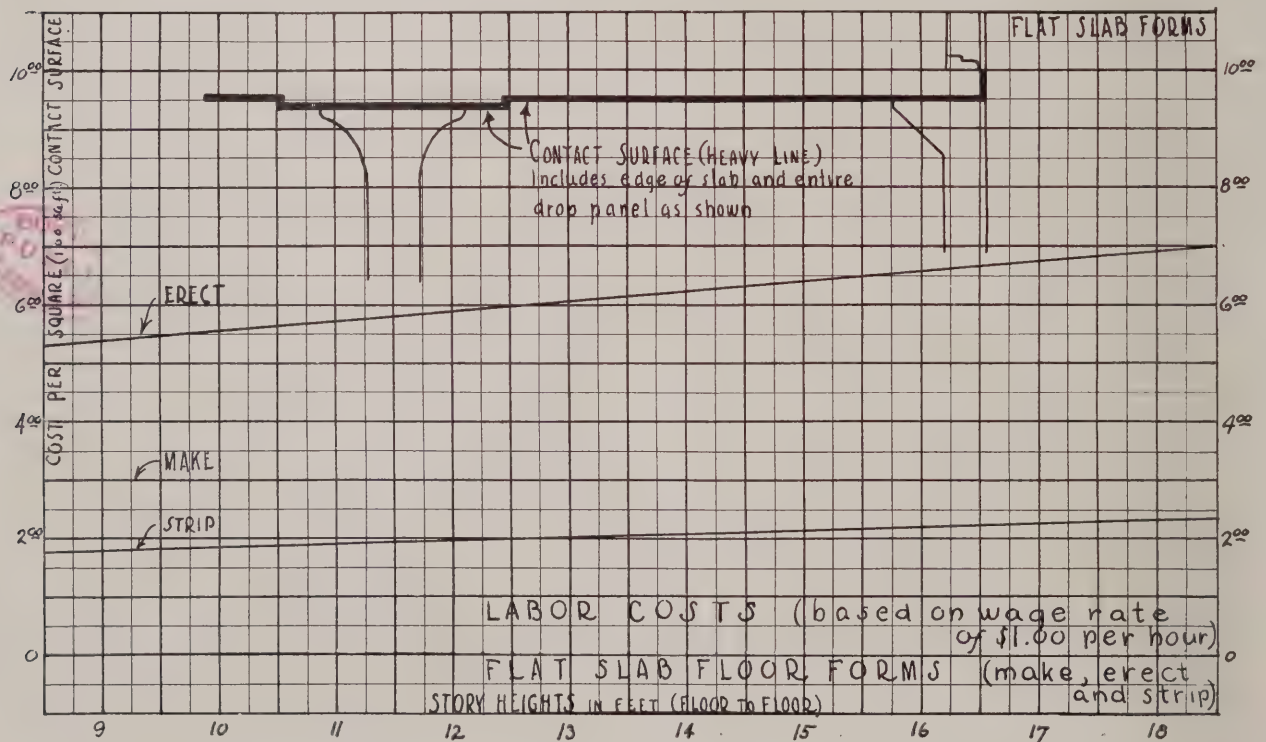
The floors were surfaced with a granolithic finish, except in the assembly hall, where a maple top floor was laid on screeds and cinder fill, all of which was placed on a concrete base. Linoleum floor coverings are used in all the private offices in the first story. Slate thresholds were placed at the corridor doors leading into the offices. The corridors are lighted through transoms. Inside stairways are of steel construction with blue stone treads, fitted with wrought iron rails and wood handrails. The roofing is of tar and gravel, together with 1½ inches

of cork insulation, which was placed on top of the concrete roof slab. All flashings are of copper and lead. The entire interior is painted, and the concrete floors are finished with a wax treatment. The building is heated with a low-pressure steam system using cast iron radiators, the system being supplied by boilers located in the basement of the building. All electric wires for light and other electrical apparatus are encased in steel conduit placed in the concrete slabs. The toilet rooms are spacious and fitted with a good grade of plumbing fixtures. One small slow-speed freight elevator was installed, the use of which is confined principally to the janitor and for the purpose of moving furniture from floor to floor. No sprinkler system was installed in the building. Construction work on this structure was begun about the middle of September and was finished the latter part of May. Work progressed continuously throughout the winter months.

Unfortunately, the unit cost data for a building of this type calls for considerable experience on the part of the estimator. There are a few items, such as timber and plank work, where data can be used without very much change. The brickwork of this building was of special bond, and the experience of the estimator was drawn upon to price this correctly. The items used in connection with the estimate of the scheme adopted were worked out from data which had been compiled for a number of years. In order to give an idea of how the data were compiled, the accompanying chart indicates the labor cost in connection with the erection of formwork for flat slab concrete floors. There are three lines drawn horizontally across this chart. The lower line represents the cost of stripping, the next line above the

cost of making in the yard, and the top line the cost of erecting the forms in the field. At the bottom are indicated the story heights, and at the left-hand margin the cost per hundred feet, based on a labor wage of \$1 per hour.

Charts of this kind are prepared for many different items of work. The placing of the lines on the chart is done only after exhaustive study of the efficiency of men on like operations, all of which is reduced to the basis of \$1 per hour. Should the labor cost be \$1.50 per hour, 50 per cent should be added to the indicated cost chosen from this chart. One will, of course, understand that the costs shown on this chart will vary with the amount of labor required in the formwork, even though the material is not considered in these costs. If a very heavy live load is required, which would call for 12 inches of concrete in the slab, the erection of the formwork would necessarily cost more on account of the additional lumber to be handled and additional posts to be placed. There have been tabulated in connection with this chart the percentages to be added or deducted, as the case may be, for form costs where the requirements vary from four posts per hundred square feet of contact surface. The chart is included simply to illustrate what pains have been taken by the cost estimator in order to compile a vast amount of data, all of which has been tabulated and is drawn upon in the making of estimates. There are many items, of course, where no data are available; it is in such cases that the estimator's experience becomes doubly valuable. As a rule the architect lacks the requisite intimate knowledge of costs which are supplied by the cost expert, but through collaboration he may obtain accurate estimates of construction costs.



PUBLICITY AND ITS VALUE TO THE ARCHITECT

BY

C. STANLEY TAYLOR

IT is perhaps unnecessary to develop any lengthy series of arguments as to the value of publicity from the architect's point of view. At least a large proportion of practicing architects recognize the direct benefits which accrue from the publication of their work in proper media, but it is surprising how few take advantage of the opportunities which are offered. Publicity is probably the most powerful factor in the development of background, which in turn tends to improve the quality and increase the size of the architect's practice. It is quite obvious that good work is slow to build up a practice unless it is made known to many people, and particularly to the types who might be prospective clients.

There are three major channels through which the architect can make known the good work which he has done, without lowering his professional standing and standards. These are, first, through the architectural press,—the publications of his own profession; second, through business papers and class publications, which penetrate into all divisions of the field of building construction; and, third, through newspapers, particularly local publications. The value of publication of an architect's work in an architectural journal is almost incalculable from the point of view of building professional standing. It seems strange indeed that this fact is not more clearly recognized, and that so few architects,—relatively speaking,—submit photographs, plans and descriptions to publications in their own field. We have heard a number of arguments on this subject, many of which were extremely shortsighted. Perhaps the most common negative is based on the fact that an architect does not see the value of placing his work before his professional brethren.

Here is the exact value of having work presented in the architectural publications. In the first place, such publication constitutes a definite recognition of the quality of the work, and represents a type of editorial approval which should be of considerable influence in discussing future projects with prospective clients. In the second place, it is of great benefit to the architect to be known throughout the profession. There are many times when prospective clients make inquiries through other architects as to the standing of those with whom they may expect to do business. It may almost be said that the original development of prestige in this field begins with comments of other architects, and it spreads gradually through interrelated contacts until suddenly there is a strong local following established and perhaps a national following. A third reason, which applies particularly to architects who are interested in having work published in the magazines of the home-building field or the publications of various commercial types, is that the editors of these publications study the

architectural journals with great care, using them as sources of information for obtaining the names of architects whose work is thus recognized and in turn is of editorial interest in their own fields. There is another point involved, known to the publishing field as "indirect circulation." It is quite possible that an issue of an architectural journal which circulates to 7,000 architects is seen by two or three times as many persons, who for one reason or another are interested in architectural work. It is often the case that the prospective builder of a house or other type of building will study these publications for a time in order to gain familiarity with the work of active architects.

The second major channel of publicity, to which we have already referred, is that of the so-called business papers and class publications which circulate to various groups of people who are interested in the question of constructing new buildings. In the home-building field, there are eight or ten powerful magazines established, perhaps for different classes of people, but having primarily to do with the problems of home-building, furnishing and decoration. Most architects are interested in having their work published in magazines of this nature, but many fail to realize the great value of such publicity and do not coöperate intelligently with editors to secure this valuable form of recognition. Almost every type of building forms the background for editorial publicity to those who are interested in the building and operation of the particular type in question. For instance, there are important journals devoted exclusively to the hotel field, hospital field, school field, industrial field, public buildings, and others. These publications almost invariably take a definite editorial interest in the building problems of the particular industry they serve. They are constantly seeking good new projects for publication, and here the architect is offered an unusual opportunity. It may be said that good architectural work, regardless of the type of building, almost invariably can find its way into the printed pages which go before an interested audience. But obviously the architect himself must help this situation along. Editors do not always know where these buildings are, and the fact that an editor has not written to obtain work for publication is certainly no indication that he is not interested. Editors are constantly seeking good material of this nature, although they cannot take everything that may be submitted; this is logical, because they are restricted in their choice to subjects which interest their particular group of readers, and restricted by definite limitations of space, and often by general policies governing the type of material which is used editorially. Architects desiring this form of publicity should carefully study the publications which reach the type of people from among whom they draw their

clients or would like to draw them. If, for instance, an architect has completed a good hotel building, regardless of how small it may be, he should study the publications of the hotel field and send his material to that which seems to him most logical and most interesting. The best procedure is to write first to the editor enclosing a good photograph of the building with a general description of the work and asking him if he is interested in other photographs, plans and data.

Good photographs are the real backbone of modern publicity. This applies particularly to architectural work. It may be said that almost without exception good photographs will insure publication, because these are being sought constantly by editors, and there are not too many of them available. While it is true that the policies of most modern publications involve the obtaining of photographs with the help of good photographers, it is also obvious that if the material is supplied to them, they are more likely to use it than if it becomes necessary for them to examine the building before deciding to obtain photographs. The architect should employ the most expert photographer available, not only to properly record his work in order to be able to show it to prospective clients, but also to place himself in the position of supplying photographs for publication purposes. In this matter of obtaining publicity, ethics are involved, and editors soon learn to recognize architects who observe them. Usually any unethical procedure on the part of an architect in his relationship with editors is due to ignorance, and for this reason it may be well to mention certain common infractions of which architects are sometimes guilty.

In the first place, competing publications in any field discourage the sending of photographs to several magazines concurrently, because they are earnestly striving to prevent duplication. Editors prefer what are termed "exclusive releases," and if the architect will say to the editor that he is submitting his material exclusively to the particular publication in question, this immediately becomes a great inducement to publish it. This situation does not mean that buildings cannot or should not be published in an architectural publication and concurrently in magazines devoted to home-building interests or in trade journals. The publication in different fields and before audiences of entirely different character is generally acceptable to all editors. Thus, if an architect has designed an attractive residence, church, or other type of building which is being published in the architectural press, there is no particular reason why it should not appear in a home-building publication, church publication, or wherever its type may direct. There is also no reason why it should not appear in newspapers. Only a few magazines demand exclusive

rights covering all the many types of publications.

Editors of practically all publications which have an editorial interest in the building field have learned to give the architect full credit in connection with the publication of his photographs and plans. Newspapers are not as universally satisfactory in this respect, and the architect should protect himself by definitely releasing the photographs or giving permission for publication only with the provision that credit is to be given to him for designing the building. This question of publicity in newspapers is one which is becoming important. Newspapers very often have home-building and real estate pages on which they are glad to present recent structures, particularly if descriptive editorial material is provided. This is, of course, the most direct manner in which to bring an architect's work before the public, and in turn to build up his prestige. Here the best procedure is to submit the material directly to the editor without writing beforehand. The newspaper editor is very busy and will often not indicate any interest until he sees the material and recognizes its value.

For those who are interested in this subject of publicity, it may be noted in more detail that aside from architectural journals and newspapers, there are important publications in several fields, which take a definite editorial interest in current architectural work. These fields include hotels, theaters, hospitals, schools, clubs, apartment buildings, office buildings, banks, industrial plants, real estate, building management, dwellings of all types,—in fact any type of building which an architect designs can find its special type of publication. One prominent architect now enjoying international reputation has for years made it a definite practice to provide editors with photographs of his work upon request, often submitting the material as soon as it was ready. This same architect has written many articles for newspapers and magazines, and according to his own statement he has largely built up his national and international practice and prestige through the results of this widespread public knowledge of his work. He tells the interesting story of one article illustrating a particularly attractive house which brought 129 letters definitely referring to the house illustrated, and resulting ultimately in a number of important commissions.

There are, in fact, a fairly large number of architects, most of whom are known throughout the profession, who have built up their practices partially through the force of publicity. After all is said, it is still evident that the architectural light which remains hidden under a bushel is not likely to be seen, and it is also true that even the architect's friends forget him if his activity is not occasionally brought to their attention.

PERSONALITY AND PROSPECTIVE CLIENTS

BY

WILLIAM A. EDWARDS

EDWARDS & SAYWARD, ARCHITECTS

IN this era, the greatest of all ages for building, the practice of the profession of architecture has become the work of an organization of well trained and scholarly men, going out after business, rather than of the dignified and reserved individuals of the past sitting waiting for clients. The success of the practitioner of today is measured by his capacity for getting business and his capacity for executing it well. The first shows his capacity as a salesman; the second his capacity at keeping it "sold." Both are of the greatest importance. Think of the woeful plight of the most wonderful potential organization at carrying out a commission without a commission to carry out! Too much cannot be said, therefore, of the importance of expert salesmanship legitimately exercised in the profession. This salesmanship is not trivial, like selling a peck of potatoes, a yard of cloth or other such tangible things. It is the adroit placement of personality that persuades the prospective client to actually retain the architect to take over and expend his money in transforming his dream into the reality of a building. This is a very delicate matter, as it is equally a responsibility. To assume it, the architect must be amply prepared to carry out the obligation. It is very fine, too, for the architect to have good equipment and organization back of him to give zest and confidence to his advocacy.

The fundamental basis of successful salesmanship is psychology, with the use of diplomacy in its exercise. No two human minds that may be pitted against each other are alike, and each personality must be analyzed from points of environment. Kinships, school life, college and club life and other relationships among men must be studied and understood. After so informing himself, the architect may approach his committee or individual with confidence, at least of leaving a good impression even if a sale cannot be made. It must not be forgotten that the greatest of sales are often made even when the objective commission is lost. Winning the way to a man's mind and to his consent is for the salesman to agree with him and speak pleasingly of his vanities. There is plenty of time to persuade him to different views and convictions after he has been won. The successful salesman must think very little of the commission he is after, but mostly of the man or set of men who have the commission to give out. What he or they want must be the salesman's chief consideration. On one occasion a board advertised in current papers and technical magazines that it was charged with the duty of erecting a new university, and would meet on a certain day for the purpose of hearing architects on the subjects of how best to proceed to the employment of an architect and how best to proceed with the building of a university on 500 acres of ground. Seventeen architects met this

appointment, and each in turn was given a private interview. From back room comments, the vast majority presented themselves before the board with only one thing in mind, viz: getting the work. Others, more familiar with the situation, were of the firm conviction that the board had already been instructed politically as to the architect to whom the award must be made, and that it was therefore useless to treat the meeting as more than simply a gesture.

The architect ultimately chosen, however, complied directly with the request that was advertised, and seized the opportunity to represent the profession with dignity, and to present truthfully his belief as to the best method of selecting an architect and to set forth with his best knowledge the proper way to proceed with building their university. He took occasion, as he advocated the employment of an architect on account of his personality, office equipment and experience, to advocate their employment of an architect on that very day, if there were one that met their approval. He only said in his personal behalf that if they were not prepared on that day to make such employment, he would be entirely satisfied with his efforts if they would make a full investigation of his firm, looking to employment. The result of this meeting was that 15 architects were promptly eliminated, leaving only the political favorite and this one other architect to make presentations of preliminary studies illustrating an administration building, a dormitory and a general prospectus plan, as a criterion for aiding them in making a selection of one of the two as architect. The final result was that the political favorite failed of success, the other was employed, and his firm remained over 30 years the architect of this board for all work it did, receiving many other similar awards of work elsewhere, due to this success, besides much attendant private work, making a healthy nucleus for a permanently successful practice.

One of the hard problems the competitor for business has is the tendency eternally of a prospective client to consider the financial basis in connection with the employment of his architectural talent. However erroneous this may be, it is a problem that the architect in approaching his prospect has to contend with, and for success he must have his mind made up and be willing to lose rather than reduce his fee. One thing may truthfully be said in favor of holding to the regular professional fee, and that is that no client wishes his architect to cheapen himself. In public service, however, a board is wary about paying to its favorite architect a higher fee than any other good architect offers his services for, fearing the reprimand of the public.

It was the experience of an architect upon one occasion to meet a school board by appointment, at

which meeting there were ten other architects, each to present himself in turn, giving credentials, presenting illustrations of work that he had done, and giving every good reason that each had in self-advocacy, justifying his employment. The difficulty encountered in final conversations between the preferred architect and the board was that the vast majority of those presenting themselves had offered to do the work for 1 per cent less; otherwise, the board desired to have the services of this architect. The prompt response was that the price of services was not a proper criterion to be used in selecting an architect, so long as a standard fee was not exceeded, for in the end a cheap man would likely cost the most. Also, if the price to be paid were a consideration, their preferred architect should receive a higher fee in equal proportion to such preference. In other words, they were asked how many dollars they preferred to the man of their choice. The difficulty still remained after all argument, and finally a written contract of employment was prepared and presented. This contract was accepted and contained a clause permitting the board to hold back 1 per cent of fees until final completion of the work, and if, at that time, the members were satisfied entirely with the type of services rendered and were satisfied that the architect had duly and properly earned the fee claimed, they were on their own election and volition to pay over the 1 per cent to the architect. If not so satisfied, they were to retain the 1 per cent, and that they themselves were to be the judges. The result of this transaction was a happy ending, with all persons more than pleased, and the architect without comment received his full fee.

Many failures of an architect in the matter of salesmanship come in meeting a prospect in the form of an individual who is a supreme dictator of his community and board, and who abruptly and rudely dismisses him and turns him away because the architect himself has failed to get hold of the idiosyncrasies of the man he approaches. On one occasion, an architect went to the town where a school building was to be erected. It was promptly learned that this was a "one-man" proposition, and if one could gain audience and win him, the work would easily be awarded according to his choice. Many architects had been individually to see this man, and all spoke of him as "an old crab" and impossible to interview. Our architect, undaunted by these advices, proceeded to the town to try out his cunning. Arriving at an early hour, he immediately proceeded to become acquainted with the people of the town and soon found the friends of this man, who spoke in the greatest of confidence and praise of him and his useful citizenship, his cordial ways of dealing with people, etc. Our architect was told that others of the town, however, considered him a very stern character, hard to approach and get close to. So our architect proceeded immediately to consult with them. Out of the conversations with both factions, all of the weaknesses and vanities of the objective man were dis-

covered and digested. It was found that he took great pride in the little town, and that he, at his own personal expense and time, had created a beautiful avenue with beautiful shade trees, and that this avenue was his pet hobby. Thus armed, our architect, after the morning mail was disposed of, proceeded to test his mettle before this exacting small town ruler. Here is where the private secretary came in, for he (or she) who is the buffer must also be successfully sold in order to gain audience. This process being gone through with, the architect was admitted, and the man reposefully greeted him.

After making a few preliminary remarks in the hope that his coming in was not an encroachment on his valuable time, the architect was asked to be seated. Upon being thus seated, he immediately spoke of his coming to town early in the morning and what a privilege it was while waiting, to walk over the principal streets of the town and to find it a beautiful and well kept little place, and particularly was it his delight to visit the beautiful sycamore drive in the suburbs of the town. The tender spot was found, and the great man grew chesty, pulled out his cigars, leaned back in his chair and told the architect the history of the little town and his doings about it,—which was listened to with interest. After spending more than an hour without indicating his business, our architect arose with apologies for over-staying his time, and while standing mentioned the object of his visit. Very few additional remarks were necessary, for our architect was told that his firm was well known and particularly in connection with school work. He said, however, that the matter would necessarily have to be taken up in board meeting. A few days elapsed, and in came notice that the board had made selection of our architect's firm to do the work.

A situation in one of our states had developed very much to the embarrassment of the architectural profession by reason of the unsuccessful dealings of an architect in the execution of a piece of state work, in which instance even charges of corruption were intimated. In an atmosphere of this kind, an architect approached a board of trustees whose chairman was a United States senator, a successful politician and very much a browbeater to those who approached him for consideration. He, however, loved the combat of minds and despised persons approaching him who did not give him back in kind equally as he dealt. The method of handling him, therefore, was necessarily with gloves off. Convincing retort handed back with courage but kindness is what it took to win him. He and the architect talked on the campus alone together after a number of sessions before the committee, and the senator proceeded at once to explain the disrepute in which the profession happened to be held at that moment. The quick retort was to remind him of the many United States senators who had brought reproach upon our country, and that United States senators after all, are human beings, subject to all the infirmities of other human kind,

and that it was greatly to the benefit of the United States senate and the profession of architecture, that a vast majority of both were men of noble character, and there was no reason why a good United States senator and a good architect could not yet relate themselves with each other in perfect confidence.

It was soon discovered that the distinct object on the part of the senator was to tell the architect of his excessive fees. The senator said that for one building he was asking more compensation than had been paid for similar services for other buildings on the campus. Readily the retort was that the buildings on the campus were a just demonstration of the wisdom of his statement, and, that had a decent architect been employed in the first place, there would not be felt the same necessity for a consuming fire, as existed; and that it was high time to turn over a new leaf in the affairs of the institution. Furthermore, he was reminded that he had just discussed the profession of architecture in a derogatory way, speaking of its low ebb, and that the proposition that the architect should render his services for less, coming from a state official in such a high position as he, was itself a corrupting proposition. The profession, he was told, must have sufficient compensation to do services properly, and that an established fee legally recognized before any court as equitable should be adopted and accorded to the architect, and that it would be very much against the state's interest if he employed any architect who would cheapen himself by taking a piece of state work for less than such a fee,—that the result would be lax service, which was as bad in consequence as bad manners.

After many arguments the senator went away fully convinced, made report to his board, and the award was made to the architect with full fee. More than that, the entire board of trustees then in session felt that the services of the architect during the several days of the session deserved their consideration, and a handsome check was sent him in addition to the award of the full fee. When the services were ended and the final check for services was given, the senator stood up like a man before the architect and said: "In handing you this final payment, I wish to add that your services have been of a high order, greatly to the gratification of our board, and I personally wish to say to you that the state has not paid a cent too much for your services."

In the era of plan-juggling of 20 years ago when highly colored drawings of court houses and schools greatly factored and flourished, the impostor in the profession of architecture had his greatest day. This practice is sometimes encountered yet, and has to be dealt with by the practitioner. On one occasion, architects were invited to present sketches in competition to a school board. It happened that a wealthy and prominent citizen of his state and community lived in this district, and the board in charge desired his approval of its operations, since this man paid a major proportion of the taxes of the district. The sketches, therefore, were required to be sent to his

home town on a certain date and then to be carried to the county seat for final discussion before the assembled school board.

Incidentally, the architect of this tale followed his sketches and acquainted himself with the chairman, who was the strong man of the board, before the meeting for the submission of drawings. A number of architects met on this day of final submission, many of whom violated the instructions to send drawings in as already explained for preliminary consideration. In its deliberations the board, however, made no discrimination against those who did not comply strictly with the advertisement. The impostor architect was there and showed the board drawings for a building two or three times larger than those of any other competitor, guaranteeing its cost to be within the stipulated price. The chairman of the board, happening to be a builder, knew that this building could not be built within the amount of appropriated funds, but believed the others could. Consequently, the first days' deliberations of the board reached no conclusion and were held over for further consideration the next day. In the evening, the chairman of the board was called to the hotel room of the impostor-architect, and adroit overtures of all kinds were made to him to accept a fee to supervise the construction of the building, receiving the compensation from him,—the impostor. This was listened to with interest and declined, and finally the impostor-architect made the proposition to pay him the entire fee accruing from the commission for the award of the work to him, claiming it to be an advertisement to design this building which would justify this business action.

The chairman, wise and honorable, came to the architect who ultimately secured the work, setting forth all the facts, including that there must be a guarantee that the building would be built within the funds appropriated, with the contract awarded to a responsible contractor and with a surety bond for 100 per cent of the contract price given. The chairman's statement was that—"I know there is a nigger in the wood pile somewhere, but tell me where it is. I know he cannot do what he says he can do." In the first place, this chairman was told that he would have to make a check for services payable to the impostor-architect, which he would pocket and carry away, and that he would not be able to get it back if he wanted to. In the second place, the impostor-architect would award the contract within the contract price, deliver the bond, as agreed and proceed with the work. Over the impostor-architect's signature, his board would be compelled to make payment to the contractor. A certificate in excess of a just proportionate amount paid to the contractor would be a violation of the bond, and by collusion between the impostor-architect, the contractor and the bond salesman, they could secure the first payment with all apparent legitimacy, then walk out of town leaving them with the "bag to hold" without any legal recourse whatsoever. He was also told that many

things as infamous as that had happened. The result of the deliberations of this board was a complete turn down of the proposition and the award of the work to an architect in whose judgment and plain statements this chairman had implicit confidence, and whose design was preferred by the millionaire citizen.

The only times we know of the infamy of the impostor-architect is when he is unsuccessful, and only then the true story is related. Many such things happen in our professional business, but those involved either by ignorance or infamy will decline to tell the story for the same reason that the victim will not relate the story of the rape of the confidence man if he is "picked up." The beauty of the long run, however, eliminates and abates crime and ignorance, and wonderful is the waiting that in the end finds virtue and success eternal. Enlightenment, of course, eliminates the impostor, who is only a time

server. The reader must bear in mind that successes are attended with many failures. Failure defines the meaning of success, and by that we know and appreciate it. No one loves to hear the stories of failure, which are seldom told.

Personality plays a most important part in all dealings with prospective clients and no less in one's contacts after the contract is signed. Each client differs in attitude, taste and prejudices from every other, and the architect who takes the particular characteristics of each client into account and governs his own conduct and conversation accordingly, is the most likely to be successful.

It is hoped that the potential architect may find food for his imagination in the actual incidents related here, and proceed with courage to his trust to make good and advance his profession in the dignified ministration it truly gives to the building world.



Entrance, Girls' High School, Atlanta
Edwards & Sayward, Architects

FEE PLUS COST SYSTEM FOR ARCHITECTS

BY

WILLIAM STANLEY PARKER
OF THE OFFICE OF R. CLIPSTON STURGIS

THERE is more than one way to skin a cat, and I suspect the same to be true regarding the use of the fee plus cost system in architectural practice. Its two elements, fee and cost, are both variable at will. The fee may be made to cover the entire services of the members of the firm, or it may be in addition to other charges based upon the time they actually spend on the work. The items of cost may or may not include the just mentioned items for time spent by members of the firm, and may well vary in minor items charged by some as cost, by others as overhead. In writing on this subject it should be understood that I am not describing the only method or even the best method of charging on this basis, but merely the way in which the office with which I am associated has been using the system for practically 25 years.

It will be well first to state just what our fee covers, what items are charged at cost, and what items are covered by overhead and how they are charged for.

The fee is the profit item for the office as a whole, in which Mr. Sturgis and his associates have variable percentage interests. Mr. Sturgis' interest in the fees constitutes his whole interest in the earnings of the office, no other charges being made for any time spent by him. Apart from the fee our charges fall under these various headings: "Drafting and Overhead," "Engineers," "Clerk of the Works," and "Miscellaneous."

Under *Drafting* is entered, at their various hourly rates, all time spent by members of the office other than Mr. Sturgis, whether that time is spent on drafting, specifications, conferences, or inspection. The total of these drafting charges is doubled to cover overhead. In our case "*Overhead*" includes rent, stenographers, office boy, telephone, postage, supplies, cleaning and time spent by members of the organization on office work, such as office conferences and general office problems not related to any particular project. We have found that with an average volume of work the total drafting charge is substantially the same as our overhead items. In busy times it is more, in slack times it is less, but these two equalize each other in the long run.

Under the heading of "*Engineers*" we include, at cost, the fees of structural and domestic engineers, and any other specialists that may be engaged on the work.

Under "*Clerk of the Works*" we charge at cost the salary of the clerk of the works if one is employed. Occasionally, when a clerk of the works ought to be but is not employed, we estimate the additional office supervision that will be required and charge it under this item instead of under draft-

ing. This means charging the time spent in such supervision as single time, not doubled to cover overhead as for other drafting time. This is fair to the owner, as it charges that time singly, as the time of a clerk of the works is always charged. It is a burden to the office, however, as it reduces the drafting time with which to cover the overhead.

Under the heading "*Miscellaneous*" are charged up net for reimbursement the various minor expense items directly connected with the particular commission, such as traveling expense, long distance telephone and telegraph, blue prints, models and similar items.

Perhaps the best way to illustrate the system is by a copy of one of our "Monthly Statements." Our bills are properly so captioned, because all our accounts are based on monthly payments on all our cost items and also on our fees. In the case of the latter about 20 per cent is withheld for payment upon completion of the work, the balance being divided into monthly payments during the estimated duration of the project. Thus the statement herewith reproduced is the third statement issued, the fee item (entitled "Professional Services") being the third of nine monthly payments of \$130 each, a total of \$1170, the balance, \$130 (in this case 10 per cent of the \$1300 fee) being held for payment on completion. The first column, "This Statement," is the current account payable. The second column, "Previous Total," is the accumulated total of all previous statements. The third column is the estimated or guaranteed cost of each item.

At the right the current summary is repeated, but these spaces are primarily intended for use when a guaranteed limit of cost for certain items has been agreed to. When this is true the items guaranteed are generally limited to the fee, drafting and overhead, possibly also including engineers, but generally not including the other items. This final right hand summary can show the condition of the guaranteed amount,—already paid, current charges, balance remaining. In such a case the items in the third column that are not included in the guaranteed limit are marked with an asterisk.

In an effort to reduce to a minimum the time required for entering the drafting charges of the various projects, we developed a monthly time sheet for each man as here reproduced. This is 9 x 12 inches and vertically is divided into five weeks of six days each, some months for accounting purposes being "five-week" months.

The three final columns are for the totaling of hours spent each day and each week, and the daily record and accumulated total of "due" and "ex"-cess hours, or in other words, the number of hours a man

is behind or ahead of the normal number of hours covered by his weekly salary, showing whether he owes the office or the office owes him a balance.

The right hand totals adjust each man's time and money in relation to the office. The totals at the bottoms of the columns show the total hours spent on each project and the total charge against the project.

This monthly time sheet has saved a great deal of time previously spent in making entries on weekly time sheets from which the various subdivided entries were drawn off and entered in ledgers. This one sheet now gives each man's complete record for the month. The totals are of course entered in the ledgers against the appropriate projects and the office accounts.

All this indicates briefly how accounts are kept and charged.

The exact amounts indicated in this Statement are of no significance, nor would any reproduction of exact charges rendered on different kinds of work be illuminating. No two offices would arrive at the same amount, either estimated or actual. The Fee, Drafting and other items would all vary, for a given piece of work, due to different office practices. This typical statement form is reproduced merely to indicate the way in which the few items involved are recorded from month to month, each statement conveying to the client a complete account to date.

Our form of agreement with the client, after defining the work and the service to be rendered, recites the given items and how each is charged for. It also arranges for the adjustment of the contract in case it is terminated, and we feel it does this in a simpler way than that contained in the Institute Fee Plus Cost form. In our form the owner, if he terminates our employment, pays all charges provided for up to the date of such termination and the portion of the fee, usually about 20 per cent, that is due upon completion of the work. This is definite, without any items to be settled by agreement, no discussion is involved, and the withheld balance of the fee will be found to adjust the matter of fee with substantial fairness, no matter at what stage of the work the break may come.

It of course is but seldom brought into play, but when it is there is hardly a possibility of strained relationships under which amicable adjustment of any uncertain financial settlement might be difficult. Our method is simple and positive and obviates any discussion.

We have used this system of charging with many different types of clients. Frequently in talking about the system with architects they have said that it was logical enough, but it meant explaining the system to each client who wouldn't understand it and who would be familiar with the percentage fee, and so it was simpler to stick to the older method. This bugaboo of what the client will think is largely in the mind of the architect rather than in that of the client.

The number of clients, in our practice, that have disliked the system or found it difficult to understand has been negligible.

Generally they feel it is sound and reasonable. Sometimes they want to translate the result into terms of percentage, but while they may do this in their own minds, there is seldom any particular comparison. They rather like the basic idea that our fee is a fixed amount, regardless of any fluctuation in the final cost of the work. If the work is increased or diminished to any substantial degree, after the agreement is settled the amount of the fee is adjusted accordingly. This is seldom necessary and never a source of difficulty. Apart from such cases the fee is a fixed amount.

All the other items, however, are stated as mere estimates and not guaranteed, and so they will vary according to the conditions as they actually develop. If sketches are promptly approved, if frequent changes are not made in the drawings at various stages of the work, if the construction is carried through quickly and competently by the contractor, most of which matters are beyond the definite control of the architect, then the drafting and overhead charges will be kept at a minimum. If reverse conditions develop, such charges will doubtless increase.

Some clients of course, for varied reasons, prefer some kind of agreed limit, but they have been rare in our practice. In one case it may be that they will want the total of the fee, drafting and overhead, and structural engineers, to be not in excess of some named percentage because these items comprise the services generally covered by a percentage fee. In another case they may prefer a guaranteed limit for all services, even including the clerk of the works. These varying desires should be met by the architect in an accommodating spirit, and a clear knowledge of past office experience on similar projects makes it relatively easy to determine fair amounts in any such case. Certainly it requires no greater degree of acumen and prescience than is required in many cases to determine what percentage will be appropriate and just what that percentage will cover.

Of course the simplest mental operation is with a hard and fast schedule, say 6 per cent, for all kinds of work. But it is neither very scientific nor fair. One architect said to me once that he had always done all his work on a 6 per cent basis, but always lost money on his houses and helped cover this loss with his commercial buildings. Now it seems to me unfair, both to himself and perhaps in many cases to his fellow architects, to take, for instance, houses at a percentage below actual cost. It is an economic absurdity to design and supervise an owner's dwelling for less than the service costs one. And it is quite likely that some other architect who perhaps doesn't have much commercial work and who charges for house work at a rate that will produce a profit, may be told, "But so and so does houses at 6 per cent.

THE OFFICE OF
R. CLIPSTON STURGIS, Architect, 120 Boylston Street, Boston

MONTHLY STATEMENT

December 1, 1927.

John Doe Esq.,

To Office of R. CLIPSTON STURGIS, Dr.

For Work on House

at Blank, Mass.

SERVICE	THIS STATEMENT	PREVIOUS TOTAL	ESTIMATED OR GUARANTEED COST	DATE OF AGREEMENT
Professional Services 3 of 9	\$130.00	260.00	\$1300.00	Oct. 1, 1927
Draughting and Overhead	554.14	1090.84	2000.00	
Engineers		29.44	50.00	Previous Charges
				\$1397.78
Clerk of Works at				This Charge
Printing Specifications				\$698.31
Incidentals	14.17	17.50	100.00	Total Charges
				\$2096.09
APPROVED	Total \$1397.78 \$3450.00 Account Rend. TOTAL DUE \$698.31			Balance
	Received Payment,			Note: Items starred are not chargeable against limit.

A Complete Statement is Sent to the Owner

Why do you charge more than he would charge?"

If an architect uses a percentage system, he certainly must adjust the percentage to suit different types of work, and in each case there will be additional items to be charged at cost. These items will always involve miscellaneous expenses such as travel, etc., and I suspect with most architects the cost of domestic engineers will also be charged for apart from this percentage, though doubtless many now include them in their fee.

The difference between the systems is therefore not so great as it sometimes seems. It is a case of a "profit fee" plus costs or a "percentage fee" plus costs. In either case an appropriate total can be arranged with no difference in the amount of judgment involved. The main difference is that the so-called "fee plus cost" system is based upon each project, carrying a stated professional fee that is guaranteed, in addition to reimbursement of all costs, and that this fee when once established ceases to be affected in any way by the cost of the work. It goes without saying that I am speaking primarily of operations of definite extent and not those that are indefinite in all their major factors of size, time and cost. But even to such enterprises the system is equally applicable.

This method of charging is so flexible as also to

fit quite easily those operations involving repeated units, like housing developments, to which the standard percentage fees cannot be applied without adjustment. Obviously the character of the service, its duration and the approximate total cost of the work must all be considered in either case. In the fee plus cost method the resulting estimates of profit and cost can be set down direct. In the percentage method they are translated into terms of a percentage, and that is set down. Which is the simpler method?

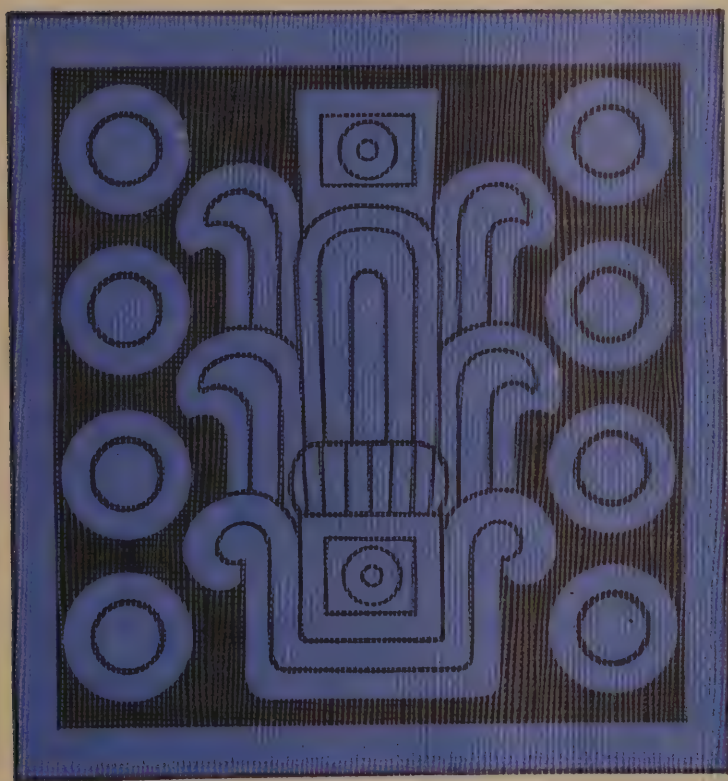
The advantages of the fee plus cost system from the point of view of the architect are therefore, (1) a known fee or profit for the architect; (2) an assured sum each month from the owner, covering the actual cost of the office work and the proportional amount for overhead, which simplifies the financing of the architect's office; (3) more prompt and definite decisions on the owner's part and freedom from annoying changes in the work, since he realizes he must pay the additional costs of drafting involved each time he changes his mind about this or that. Under the percentage system the architect is often imposed upon in the matter of changes due to whims of the owner, and an unfair burden of cost is placed on the architect through no fault of his own. With the fee plus cost system the owner pays for all work.

MO.		YEAR		OFFICE OF R. CLIPSTON STURGIS ARCHITECT												MONTHLY TIME SHEET OF JOHN DOE												TOTALS		TIME		TOTAL
OCT.		1927		DAY	THOMAS	LANE	CHANDLER	FRENCH	MCARTHUR					PROSPECTIVE	OFFICE	S-H-V	DAY	WK	DUE	EX	DUE	EX										
27																ill	7	7														
28																"	7	7														
29																"	7	7														
30	4				3										1			8														
31	4				1										2			8														
1	3																3	40									1					
3	4				1									Dr. P.	2	1		8														
4	at job.	6													2			8														
5	4							2							2			8														
6	3½				2		1½								1			8														
7	5				1										1			7														
8																	39															
10																		8														
11	4				3												7															
12																Hol.	7	7														
13	4				1		1								2			8														
14	5				2										1			8														
15															1		1	31									8					
17	6														1		7															
18	at job.	6													1		7															
19	6														1		7															
20	6														1		7															
21	5													MRS S. SARGENT.	2		7															
22																	35	4									4					
24																	7															
25																	7															
26																	7															
27																	7															
28																	7															
29																	4	39														
JOB HRS.	75½	14				2	39						4	18			7	184									11					
JOB CHGE	154	77	28	70	4	10	79	95					8	20	36	90	14	35									22.55					

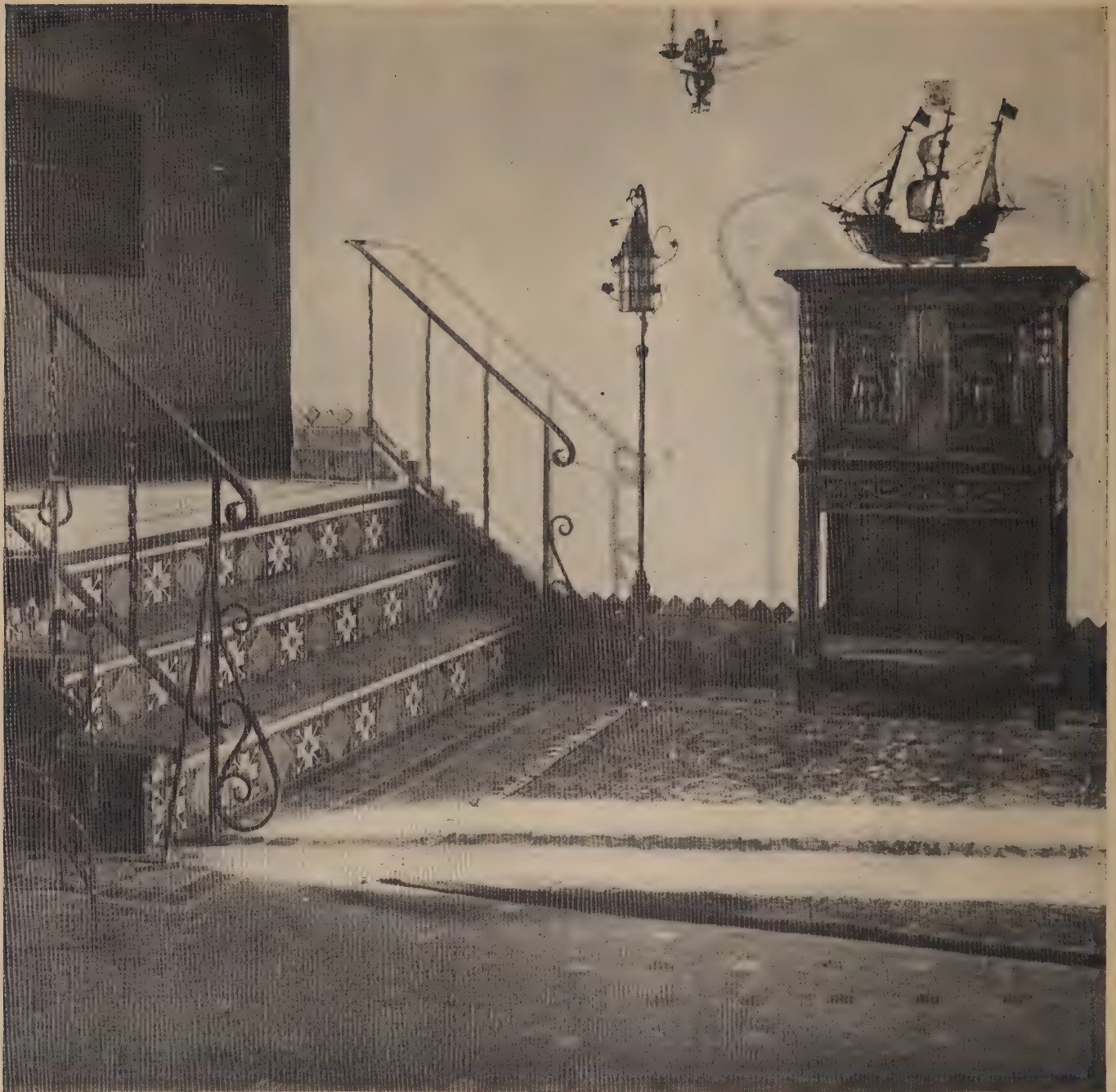
The Monthly Time Sheet of Each Draftsman Facilitates the Apportioning of Charges to Each Project

THE
ARCHITECTURAL
FORUM

IN TWO PARTS



PART ONE
ARCHITECTURAL DESIGN
MAY
1928



Entrance hall of the Barcelona Apartments, Forest Hills, N. Y.

Boris W. Dorfman, Architect

GOLDEN brown tile steps and a golden brown tile floor contrast with plain plaster walls to give this Spanish entrance hall a colorful grandeur. The floor is of 6 x 6 unglazed Faience tiles in golden brown combined with smaller units of 1½ glazed Faience tile in emerald green, deep blue, crimson and canary yellow. The base repeats the same colors in glazed Faience. The risers of the steps are decorated Faience tile in blue and yellow—the treads repeat the golden brown of the floor.

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ASSOCIATION TILES

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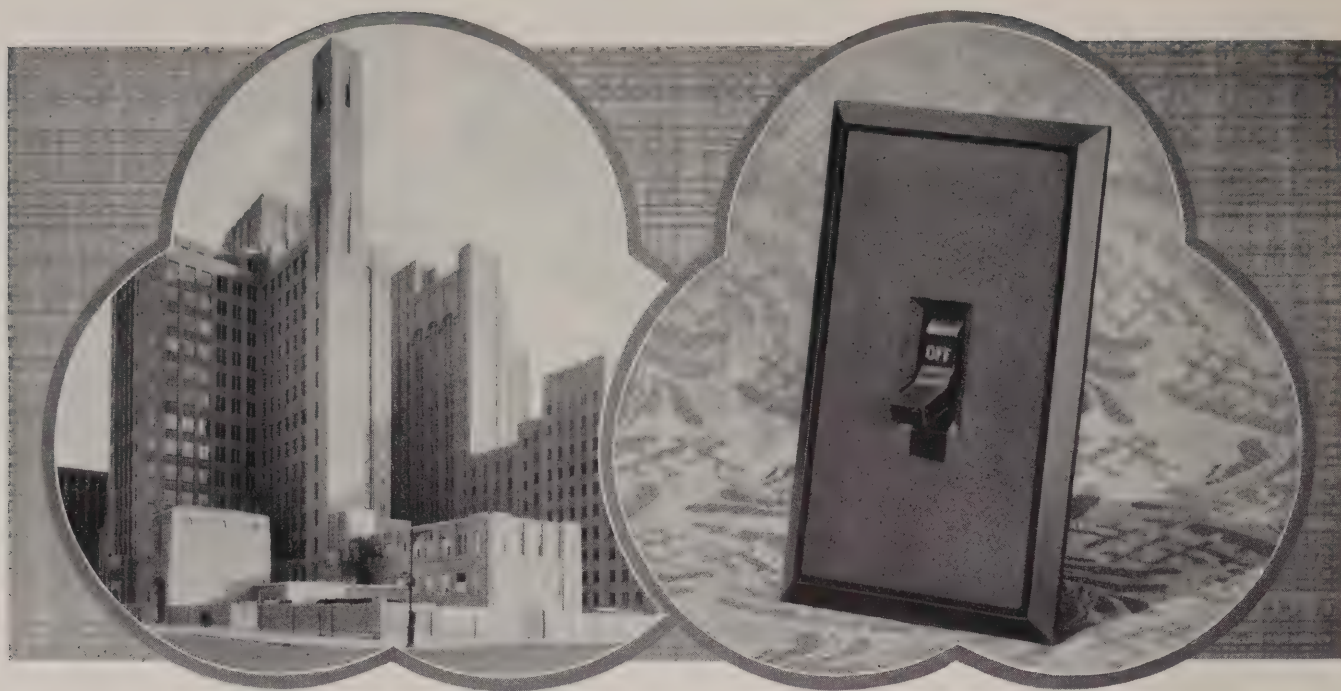
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Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat
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BOOK DEPARTMENT

A REVIEW OF RECENT AMERICAN ARCHITECTURE

AMERICAN Architecture of the Twentieth Century" is a portfolio of illustrations and measured drawings of some of the most notable modern buildings. In his interesting preface, Louis Mumford explains that American architecture presents a series of paradoxes. It has sought the antique, but achieved the modern. In the days when an architect was free to work with an eye for beauty alone, the result in many cases was failure. When, on the other hand, the architect is hampered by many utilitarian needs, such as questions of access, light, air, transportation, and so forth, the result, in many instances, is magnificent. The characteristic setback skyscrapers came about not by experimentations of the architect, but because of the intent of the New York building code to provide a modicum of light and air to surrounding buildings. Our architecture has achieved a modern style, in contrast to that of the Europeans, without any definite program of modernism. The buildings are modern in spite of themselves. It arises from a straightforward facing of the problems of function. During the nineteenth century, architecture developed slowly, because we interposed between function and expression an unrelated set of rules, having to do with use of the five orders, symmetry, historic style, and so forth. If we are moving toward coherent design, it is because of the mechanical complications of the modern building; function be-

comes insistent. This keeps the architect from designing obsolete imitations. A modern building must be mechanically adequate, and this by a paradox has helped the architect rather than hindered him in the creating of new forms. Another paradox is that our ornament has become more playful as our mechanical requirements have become more rigid. In our buildings the plans, which were originally laid down by the architect himself, are now almost wholly outside his scope; the amount of floor space, number of floors, and other details, are determined by the financier and engineer before the architect gets to work. Aside from the problem of working the mechanical requirements into an interesting mass, the architect is limited to what was formerly the weakest department in modern architecture,—designing the ornamental detail. Our emphasis on mechanical utilities has caused ornament to come back. Just as the depressing routine of office and factory has its counterpoise in jazz, our mechanical forms, in terms of cubic feet of air, square feet of rentable space, etc., have their off-set in the gay forms of decoration which have appeared on the best of our office buildings. There are enough fine examples to show us we have made a start on a road worth following.

The first building dealt with in this portfolio is the Shelton Hotel, New York, Arthur Loomis Harmon, architect, thought by many to be one of the finest ex-

The Smaller Houses and Gardens of Versailles

By Leigh French, Jr. and Harold D. Eberlein

FOR the moderate-sized American suburban or country house there is nothing to follow in the way of a type at once more beautiful and more practical than the seventeenth and eighteenth century French houses of the same kind. The type possesses that graceful balance in the way of exterior design and that slight degree of formality of interior which is being expressed in current domestic work of the same character; and from all the domestic buildings of seventeenth and eighteenth century France there is nothing which offers a more fruitful basis for study than the smaller villas built near Versailles for the attendants of the French court. These buildings possess in an unusual degree just those qualities in the matter of design now most sought for in America.



THIS volume, prepared by two students of French and American architecture, is a practical study into the adaptation of the simpler French forms to American conditions. There is not one of the many villas illustrated which does not afford abundant suggestion in the way of exteriors to present-day architects, and the interiors with their simple and graceful disposition of wall paneling, mantels, and stairways abound with suggestions for working out interiors to accord with the expression given by the buildings' exteriors. Plans in many instances are easily adapted for use today, and the arrangements of the gardens and other outdoor areas offer suggestions for making these important adjuncts to American suburban or country houses heighten the character and interest of the buildings themselves.

202 Pages, 9¾ x 11¾ Inches. Price \$6

ROGERS & MANSON COMPANY, 383 MADISON AVENUE, NEW YORK

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

French Farm Houses, Small Chateaux and Country Churches

By *Antonio di Nardo*

With Preface by Paul P. Cret



THE buildings of no country offer more in the way of inspiration for present-day architects than those of France. French towns and villages are filled with fine old houses and shop buildings, and the countryside abounds in farmhouses, farm structures singly or in groups, manor houses large or small, and the rural churches and wayside shrines which are among the most beautiful buildings of their kind in the world. All these structures by reason of their direct and practical designing supply the best possible precedent for modern work.

This volume contains more than 300 half-tone illustrations of buildings of this character, and in many instances illustrations of details are given, with drawings showing the bonding of brick or the arrangement of half-timber construction. *The work would be worth many times its cost to any architect interested in the design of domestic buildings and small churches.*

176 pages, 12 x 16 ins.

Price \$18 net

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383 MADISON AVENUE NEW YORK

amples of modern architecture. An illustration shows the entire facade from the west, where the interesting division of mass, and the fine relationship of the vertical lines in opposition to the horizontal are seen to advantage. There are illustrations of the excellent detail of the windows; and the main entrance, showing the simple use of ornament. The west elevation is given in detail, together with the floor plans of the hotel. The Bowery Savings Bank, New York, York & Sawyer, architects, is dealt with; illustrations are given of the elevation, details of the entrance, showing Romanesque influence, and elaborate portals, interesting windows with their grotesques, and details of the main arch. There are three illustrations of the interior which are of particular merit. The American Radiator Building, New York, Raymond M. Hood, architect, shows to advantage when photographed from Bryant Park. The novel treatment of detail, well shown in the illustrations and drawings, together with the floor plans, gives one a very clear idea of one of the most famous modern buildings. It is particularly refreshing to note the simple architecture of the Ford Engineering Building, Albert Kahn, Inc., architects. The use of the order, the medallion, and the tile roof, are altogether pleasing. There is given an excellent illustration of the New York Telephone Building, from the Hudson River. Illustrations of the tower detail, of the corridor, and some distinctive bronze castings, are well worth while, and there are excellent drawings of the elevation and details. Cass Gilbert achieved an interesting general plan, and forceful building, in the U. S. Army Supply Base, in Brooklyn. The structure, and the massive bridges over the avenues, are wholly in keeping with the type of building, and the illustrations show the clever play of shadows emphasizing the vertical lines of the structure. The Bush Terminal Building, New York, Helmle & Corbett, architects, was one of the first skyscrapers of the newer type that combine the utilitarian requirements with distinct beauty. The excellent ornament on the upper stories, and the restrained ornament of the entrance, are details that make for the betterment of American architecture. An interesting example in Los Angeles, Grauman's Metropolitan Theater, William L. Lee Woollett, architect, has an almost barbaric appeal of unique distinction. The massiveness of the scale, and the imagination displayed in the interior architecture, are particularly fascinating. Classic motifs, and motifs of the most primitive sort, are used side by side, producing an exotic effect, which in the case of a theater is perhaps desirable. At the same time, there is the strength of the orders, and the large scale of the ornament gives a certain savage flavor to the whole. Plates and plans of the University of Michigan Union, Ann Arbor; Alabama Power Co. Building, Birmingham; Hollywood Terminal Building; and the Indianapolis Public Library, present these structures in detail. To the architect or to anyone interested in the better type of American architecture, the work should prove invaluable, as the scope for study in each example illustrated is wide, and the buildings illustrated and described have been carefully selected, with an eye to their practical planning and designing.

AMERICAN ARCHITECTURE OF THE TWENTIETH CENTURY, VOLUME 1. A Portfolio of Illustrations and Measured Drawings of Modern Civic, Commercial and Industrial Buildings. Edited by Oliver Reagan. Plates 14 x 20 inches. Price \$26.50. Architectural Book Publishing Co., Inc., New York.

MODERN FRENCH SHOP FRONTS. By Rene Herbst, with a Foreword by James Burford. 54 plates, 10 x 12½ ins. John Tiranti & Company, Tottenham Court Road, London, W. I.

ARCHITECTS who keep abreast of the century and its peculiar architectural developments should buy and send copies of "Modern Shop Fronts and Their Interiors" by Rene Herbst to all the more enterprising civic fathers in America. It is a book which should make them take notice of the possibilities latent in intelligent coöperation between manufacturers and skilled designers. One hears considerable talk in this country, and particularly in New York, about "art nouveau," modern architecture, modern furniture and the like. One hears of modern design in window displays, but one can, for the most part, judge of it only by the taste of the window decorators who conceal stockings as fruit in an "art nouveau" tree, or pile French handbags in pyramids and cylinders. Recently the outlook has become somewhat more hopeful, for the more forward-looking department stores are beginning to develop their embryonic and bizarre ideas. In order to see where this development can lead, they have only to turn the pages of this book, "Modern French Shop Fronts," which shows how far ahead of them the designers and merchants of France and Belgium are at present.

Why would this book stimulate American architects, and shop owners? Because it shows that "opportunities of advertisement and display" (to quote the foreword) can be successfully combined with good design on modern lines, these lines involving elimination, simplicity, and significance. What better opportunity for successful collaboration could there be than in the designs of shop fronts? In what country are there more shops than in America? What country is more pitifully lacking in any accomplished "modern" collaboration, save in a few much talked of and over-emphasized buildings? The book under consideration shows by means of adequate illustrations what some of our European contemporaries have accomplished and shows not only the high standard of excellence of their achievements, but also the soundness of their æsthetic and business senses.

A book of illustrations needs little reviewing; it speaks for itself, and even the least bookish, once having turned the top cover, would continue turning the pages of this volume to the end, for the book is of convenient size, printed on light weight paper, and (what is more important) it holds the reader by its contents. The designs chosen are not all equally commendable,—who would want them to be?—and it is difficult to find out if they are truly representative; but they do at least supply a good basis from which to judge, and they are consistent in certain respects. The designs keep well within the limits set by the solution of the particular problem in hand. The foreword by James Burford says that this problem is a series of bald precepts, and that to retail it would mean transcribing the whole preface; but on the whole the French designers are successful in making the business of shopping a charming and almost irresistible affair. The success of this achievement is due as much (and perhaps more) to the designer as to the merchant and his display, for the designing of the facade as a whole is the chief matter, and once that satisfies, the rest follows logically. The qualities of the best modern work,—simplicity almost to starkness, economy of space, and

An Authoritative Work on
"THE GREEK REVIVAL"

By HOWARD MAJOR



THE search for effective types of architecture for domestic use led logically to the re-discovery of the style known as the "Greek Revival." In the hands of a few particularly skillful architects it is being used with marked success, their use being based largely upon study of such examples as have survived the period, just prior to the Civil War, when use of the type was widespread throughout the United States. It is an entirely American style, founded not upon a following of current English architecture but upon a study by Americans of classic types adapted to domestic uses.

Mr. Major's excellent work is the result of a careful study of the style as it was interpreted in the North and East, and particularly in the South. The illustrations of exteriors and interiors are full of suggestions for anyone seeking a variety of architecture bold, simple and effective, which supplies a fitting background for life in America. The book is richly illustrated, and shows existing work, large as well as small, in both city and country.

236 Pages; 7¼ x 10¾ inches. Price \$15

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directness,—are bound up so closely with the interests of the shop owners that their use for shop facades and interiors seems particularly appropriate. Architecture in its latest form expresses the present materialistic phase of our life very completely, and we have not, as yet, made the most of this in the design of our commercial buildings, though the outlook at present is hopeful.

Let us hope that the design of shop fronts in America will continue to improve; and if the example of what has been accomplished by enterprising European contemporaries will be a spur to our architects and merchants, this book will certainly put that result within our reach, since it stimulates by establishing valuable standards.

THE PRACTICAL BOOK OF ITALIAN, SPANISH AND PORTUGUESE FURNITURE. By H. D. Eberlein and R. W. Ramsdell, 254 pp., 6½ x 8¾ ins. Price \$10. J. B. Lippincott & Company, Philadelphia.

THE authors have characterized this work as a "handbook" for convenient reference to the furniture of Italy, Spain and Portugal, from the Renaissance period to the early years of the nineteenth century. But the reader finds it much more than a mere handbook;—it is in fact a vast storehouse of information which, in detail of fact and accuracy, is more like an encyclopædia than a handbook. In this it makes a three-fold appeal,—to the general reader, to the artist, and to the interior decorator. The amateur finds it entertaining reading, instructive as well as interesting, while the connoisseur and the professional find it a valuable source of information which they cannot afford to ignore. This is due in no small

measure to the wealth of its illustrations. The volume contains no less than 150 plates and a great number of drawings which illustrate in fine detail the designs and influences which the authors have explained.

There are in particular two features which distinguish this work from the usual treatise of its kind. First, such books ordinarily deal only with the Renaissance period of Spanish and Italian furniture, namely, the late fourteenth, fifteenth and sixteenth centuries. But this volume carries the story on through the seventeenth, eighteenth and early nineteenth centuries. It shows how the decadent and too elaborate tendencies of the late Renaissance gathered impetus and strength to burst forth in the fully developed Baroque age and its sequel, the Rococo, and on to the neo-Classic period of the eighteenth and early nineteenth centuries. Second, it deals with Spanish and Italian furniture arts in their relations to each other as well as in their differences; wherein these two great Latin countries drew from similar and where from divergent sources for their inspiration, and how each country developed it and gave it character and individuality, which made it a national interpretation.

Portuguese furniture is treated in an individual chapter, although in general its development runs parallel to that of the Spanish. Portuguese trade relations with India and the Far East brought about certain oriental tendencies in its art which Spain did not share, but which have played their important role in the designs of Portuguese furniture. Amateur and professional alike will enjoy this work and find it highly instructive. It is the latest of a highly valuable series of handbooks.

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. "Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use."



THE text of this work dwells in detail upon the working of concrete; details of construction; continuous vertical support; verticality; monolithic concrete; concrete vaulting; textures; "crazing"; and treatments; and other subjects of importance to the architect, engineer or builder concerned with concrete. It sums up and presents the experience of many successful workers in concrete construction. The volume deals with concrete and with its design as influenced or governed by its construction. Its authors have been fortunate in selecting admirable examples of the use of the material, and the work contains, among a large number of illustrations, views of residences, tall structures such as hotels, theaters, power houses, or office buildings; bridges, aqueducts, retaining walls and walls of other kinds. The views are of work in more than one country, for there are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States

Text and 100 Plates; 8½ x 11 ins. Price \$10

ROGERS & MANSON COMPANY, 383 MADISON AVENUE, NEW YORK



THE EDITOR'S FORUM



PRESERVATION OF AN OLD TOWN

BELATED efforts are being made to save the few towns in America not ruined by improvement, and to rescue and preserve in towns already spoiled the few good old buildings which still exist. Williamsburg, in Virginia, is about to undergo restoration on a considerable scale, those in charge of the project having acquired possession of almost the entire town and being now about to remove all buildings not in keeping with Williamsburg's pleasant, old fashioned architectural character, restoring the town to as nearly as possible what it was during its palmy days when it was the capital of Virginia. "In Annapolis several old buildings have been acquired by St. John's College and are presently to be restored and saved for posterity, the Brice house, and, among several others, the Hammond-Harwood house, and the Peggy Stewart house, built by the owner of the vessel that caused the Peggy Stewart Tea Party, the Annapolis counterpart of the Boston Tea Party. The Hammond-Harwood house, which will be maintained as a colonial museum, is recognized by architects as one of the finer examples of Georgian building. It is one of the few houses having semi-octagonal wings. There is no explanation for the shape of the wings, but according to tradition, they were added to take the place of an extra story, provided for in the original plan, as a concession to Edward Lloyd, who lived in the Chase mansion across the street and did not want his view of the harbor obstructed by the erection of other buildings.

"Unlike the celebrated Southern Colonial homes built from designs by Christopher Wren, Inigo Jones or Robert Chambers, the Hammond-Harwood house has the distinction of being a product of the native-born architect, Matthew Buckland. He followed patterns then in vogue, and doubtless consulted Swan's 'British Architect' for some of his models, but his own genius is apparent in his vigorous treatment of the designs he used. The lumber is supposed to have been cut on one of the farms of the first owner; the brick to have been made by workmen in Annapolis."

A TEXTILE COMPETITION

THE ART ALLIANCE of America makes announcement of its 12th annual Textile Design Competition and Exhibition to be held June 6-16, 1928. Prizes are offered for designs of costume fabrics, Jacquard upholstery fabrics, and printed decorative fabrics of silk, linen or cotton, and special prizes are offered by a number of well known manufacturing firms. Information regarding the competition and exhibition may be had of the Secretary of the Art Alliance of America, Mrs. Harriet E. Brewer, 65 East 56th Street, New York, who is in active charge of the arrangements for holding the competition.

AN INTERNATIONAL CONFERENCE

ANNOUNCEMENT is made of a conference dealing with the subjects of housing and town planning to be held in Paris July 2-8, 1928. Under the direction of Sir Ebenezer Howard, President of the International Federation for Housing and Town Planning, assisted by architects from the United States and almost every country in Europe, there will be discussed various phases of planning towns and regional developments and different aspects of the housing problem. Meetings of the Federation have been held for many years,—in Paris in 1913 and 1922; in London in 1914, 1920 and 1922; in Brussels in 1919; in Gothenburg in 1923; in Amsterdam in 1924; in Vienna in 1926; and in New York in 1925. Data regarding the conference may be had of the Organizing Secretary of the Federation, who may be addressed at 25 Bedford Row, London, W. C.

ERRATA

IN the March, 1928 issue of THE ARCHITECTURAL FORUM several errors were made in crediting the designing of buildings and the preparation of articles. The designing of the Senior High School-Junior College building at Muskegon, Mich., illustrated on page 317, should have been credited to Turner & Thebaud, with William B. Ittner, Inc. as consultants, and the article entitled "The One-Story Schoolhouse," beginning on page 409, was prepared by Ernest Sibley, of Palisades, N. J., and should have been credited to him. Credit for the designing of the Orange High School, illustrated on pages 327, 328 and 411, should have been given to Ernest Sibley, Architect, Lawrence C. Licht and Glenn A. Hacker, Associated; the building was designed by them.

ENROLLMENT IN ARCHITECTURAL SCHOOLS

EDUCATION in the field of architecture is undergoing unprecedented expansion throughout the country, according to a statement recently made by Professor William A. Boring of the School of Architecture of Columbia University. Public appreciation is increasing, and student enrollment has reached record figures. At Columbia last year, qualified applicants for admission to the School of Architecture were so numerous that the registration was permitted to exceed the number fixed as a proper limit of enrollment in this department in the interests of both faculty and students.

"The University must train architects who fearlessly accept the modern problem, solve it in the modern way, but always conform to those elemental truths which have ever expressed that beauty and good taste which distinguish all true art and which have come down to us as our priceless inheritance."

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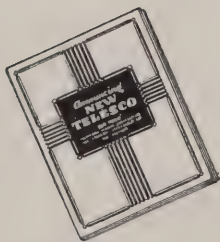


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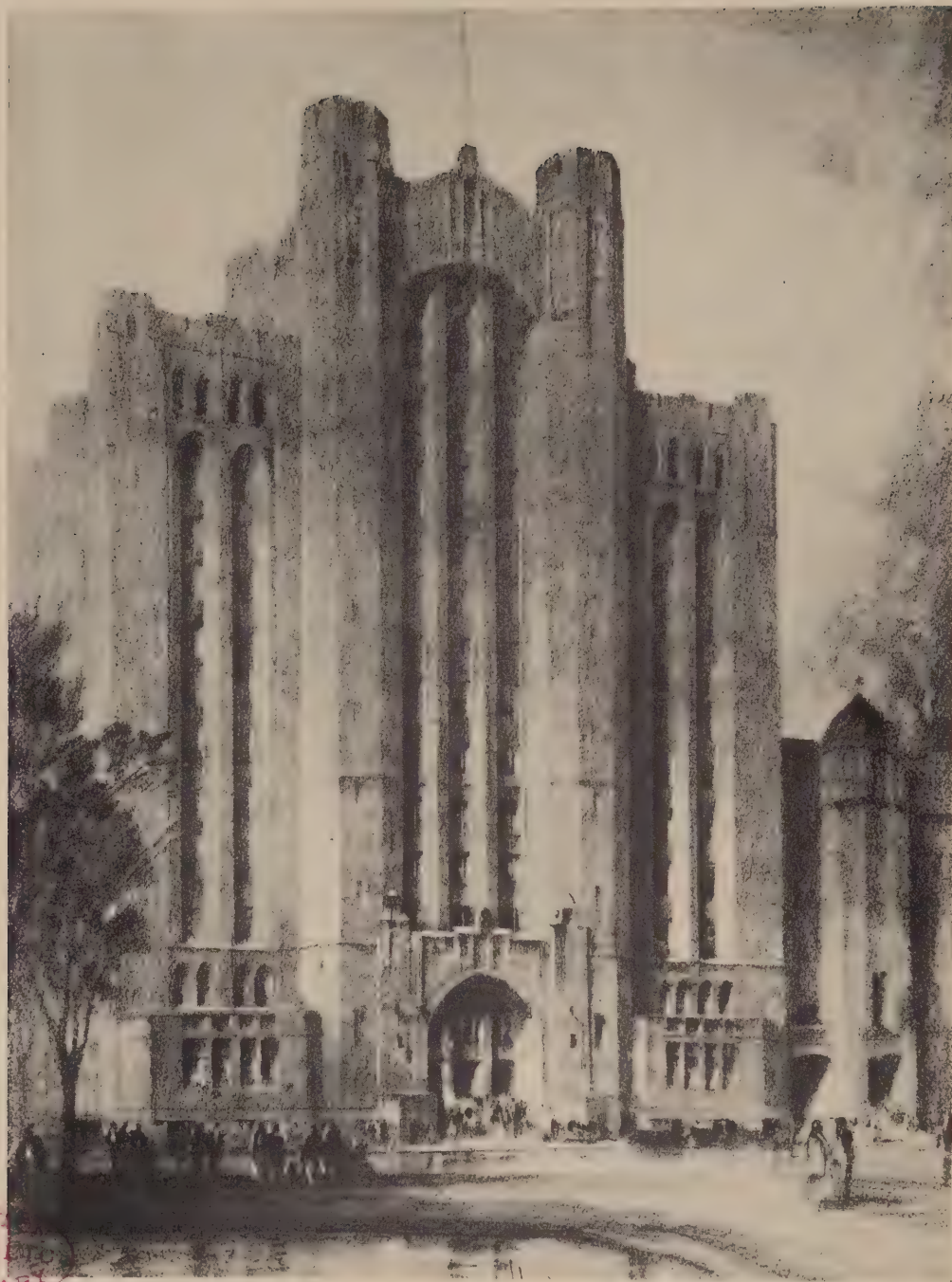
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THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER FIVE

MAY 1928



NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

BY

MAURICE LAVANOUX

IN its main lines the building of a theological seminary is certainly not a novel problem. Its aim is to provide adequate facilities for the training of candidates for the priesthood. Usually it is located amid quiet surroundings, since such an institution is eminently a place for peaceful and scholarly pursuits, well calculated to train the students for their future mission. If we admit that a well designed fabric allied with judicious planning is as necessary as a suitable location, we shall realize that the buildings here illustrated excellently exemplify this two-fold requirement, beautiful buildings in a beautiful setting.

Nazareth Hall, the preparatory seminary for the Archdiocese of St. Paul, is an institution where boys, ranging approximately from 14 to 18 years of age, receive their preliminary training before entering the major diocesan seminary. This period of training consists of a six years' course,—four of high school and two of college work. It must not be supposed that a seminary, and particularly a preparatory seminary, is a place where a boy finds a vocation. It is rather a training ground for those who feel called by God to the priesthood, and who may continue their studies in the major seminary with a consciousness of definite vocation. Nazareth Hall is situated on the shores of Lake Johanna, about seven miles from the center of St. Paul. Its possessing this ideal location is largely due to the foresight of Bishop Cretin, the first incumbent of the see of St. Paul. Bishop Cretin, along with the other pioneer members of the American hierarchy, realized the need of seminaries for the training of a native clergy, attuned to the customs and institutions of the new republic. He secured 40 of the present 90 acres. On the deed to the property Bishop Cretin wrote these words: "This property will, at some time, be used for a diocesan institution." The present seminary is the realization of the bishop's hopes.

The style of this group of buildings might be termed Northern Italian Romanesque. The strong lines of the square tower express the pivotal element of the design, connecting the chapel with the classrooms and living quarters of the faculty and the seminarians. Customarily buildings of this nature

follow a traditional expression of plan,—the long central unit with an axial entrance and two flanking pavilions with the chapel behind. The architectural weakness of this plan consists in its relegating the most interesting element of the group to the rear. This location of an important unit as an integral part of the mass detracts from its deserved importance and individuality. It was because of this fact that the picturesqueness of the Lake Johanna site determined the location of the chapel in a more symbolic and central position, so that it would dominate the entire composition. The wisdom of this solution would not be vindicated did it not at the same time permit a logical internal relation of the chapel to the rest of the group, so that it lends itself to easy circulation. Nazareth Chapel, however, is no less correctly situated with reference to the interior life of the college than it is to the external architectural interest of the entire group of buildings. An interesting principle of the plan is the relation of the convent unit to the chapel through a direct approach, and the complete seclusion of the sisters, who have their own chapel, garden and quadrangle. A study of the plan as a whole will explain the relation of the other major elements.

In buildings of such a religious nature, it is well that careful study be given to the design of the altar and the chapel. The altar is truly the soul of the entire conception of it; the thoughts of the seminarians are unceasingly directed to the consciousness of their high prerogative and privilege. The simplicity of the altar in Nazareth Chapel is its chief merit. It is liturgically ideal, and should its design influence the minds of future builders of parishes, it will prove to have been a bulwark raised against further production of those dubious "works of art" that disfigure so many of our churches. The main entrance *motif* strikes an interesting note. The sculptural treatment above the door is based on the thought of Nazareth. The guardians of the doorway are the Blessed Virgin and St. Joseph. In the tympanum is a figure of the Boy Christ with arms outstretched. Above the caps are the symbols of the evangelists. A distinguished note of decorative interest is found in a tympanum



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THE ADORATION OF THE PEASANTS, BY FRANK H. SCHWARZ, IN THE LITTLE GOTHIC CHAPEL ON THE ISLAND



THE BOY CHRIST, BY
SIDNEY WOOLETT



MOSAIC PANEL, BY CHARLES J. CONNICK, ABOVE
ENTRANCE TO THE LITTLE CHAPEL



THE VIRGIN AND
CHILD, BY A. H. ATKINS



THE LITTLE GOTHIC CHAPEL ON THE ISLAND
NAZARETH HALL, ST. PAUL
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THE GREAT TOWER AND CHAPEL FROM THE EAST
NAZARETH HALL, ST. PAUL
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over the inner main tower doorway, where Mr. Rubins of Minneapolis has painted a mural in a rarely rich and sonorous color scheme.

Both A. H. Atkins and Sidney Woollett of Boston have enriched the interior with figures of exceptional merit. The Virgin and Child by Mr. Atkins would satisfy a rational exponent of modern sculpture, and yet it closely adheres to tradition in the folds of the draperies and the Oriental exactness of the head dress. The figure of the Boy Christ by Mr. Woollett, is a charming example of intelligent realism. The iron-work was done by that most genial and talented craftsman, Frank L. Koralewsky, whose work is well known to all connoisseurs. Surely it is futile to mourn the passing of mediæval workers when the force of their traditions is in evidence today, as shown by Mr. Koralewsky's work. We have but to seek and encourage good, honest craftsmen and they will not be found wanting,—and conversely we must discourage cheap, showy imitations by commercial firms whose one thought is the quantity and not the quality of their work.

A memorial shrine,—of limestone, both exterior and interior,—is set like a jewel upon an island woodland at the tip of the property and accessible by means of a rustic bridge. His Grace, Archbishop Dowling, of St. Paul, was pleased to call this shrine "a bijou Gothic chapel." In this little building there is a triptych which contains a painting by Frank Schwarz, of New York, a young and rising painter of distinction. The subject is "the Adoration of the Peasants" and the types used by Mr. Schwarz were found by him among the inhabitants of an Italian mountain village whither he had retired to study the customs and habits of the simple and faithful country folk. The windows and



Two of the Windows by Charles J. Connick in the Seminary Chapel, Nazareth Hall

the mosaic panel above the entrance of the shrine were executed by Charles J. Connick, of Boston. Mr. Connick also designed and executed the windows in the seminary chapel. These windows are of the medallion type, so fully developed by the old masters of the twelfth and thirteenth centuries. The same spirit and ideals which actuated those craftsmen obtain throughout this series. Design is the predominant consideration and second only to the jewel-like radiance of pure color. The figures are not archæological, but, as in the ancient medallions, the entire figure rather than the features alone is made to express the idea. These windows are in groups of two each and have alternating background designs,—a foliated scroll *motif* contrasting with a more formal rectangular scheme. In the latter case large standing figures are represented in the upper portions of the windows. The subjects were chosen for their appropriateness to a preparatory seminary. Incidents from the lives of youthful Biblical characters predominate, and the stories are told in a direct and forceful manner.

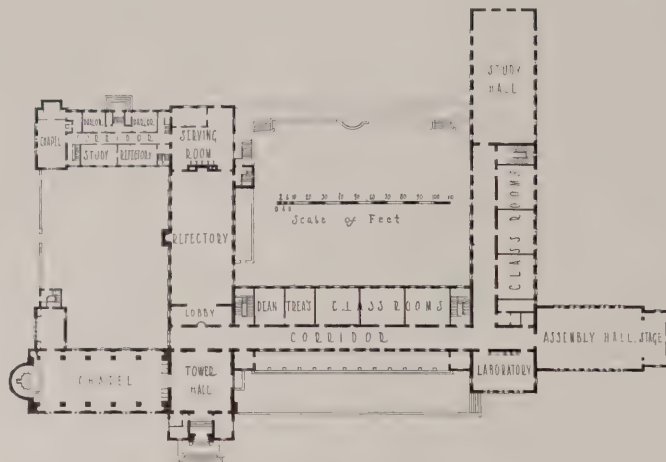
Perhaps the reader of this review will be interested in knowing that a member of the seminary faculty instructs in the history of architecture. A knowledge of the various great epochs in the history of art will be an asset to those who will, some day, undertake the building of churches and parish groups. Would it be too sanguine to hope that the study of architecture in these seminaries may direct the attention of the students to a rational understanding of styles and to a realization that no style can claim to be exclusively "religious?"—and that the necessities of the times and the materials at hand should dictate whatever style a building should have? Nazareth Hall may well be taken as such an example.



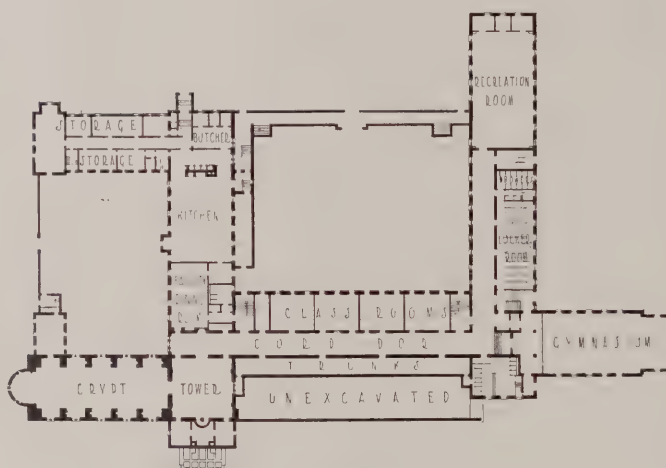
Photos. Paul J. Weber

Plans on Back

THE GREAT TOWER AND THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS



MAIN FLOOR



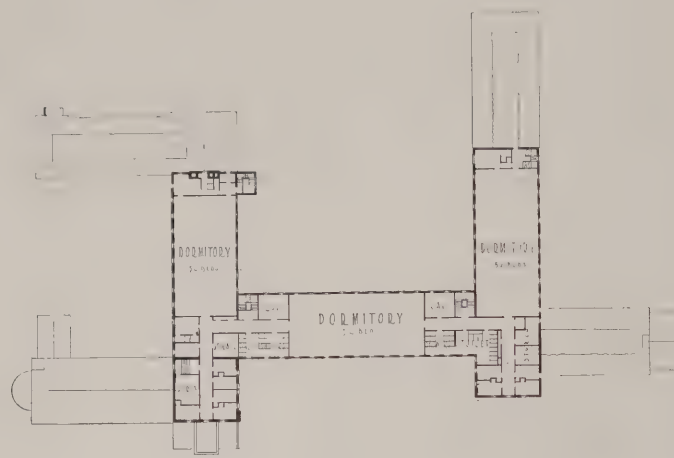
BASEMENT

PLANS, NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

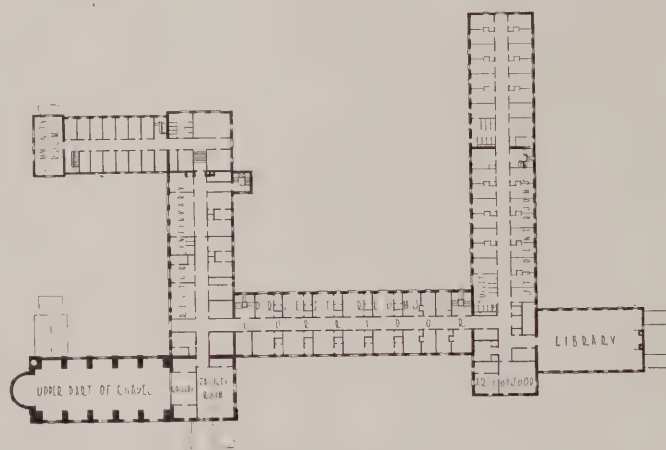


Plans on Back

THE SANCTUARY, FROM THE ENTRANCE OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS



THIRD FLOOR



SECOND FLOOR

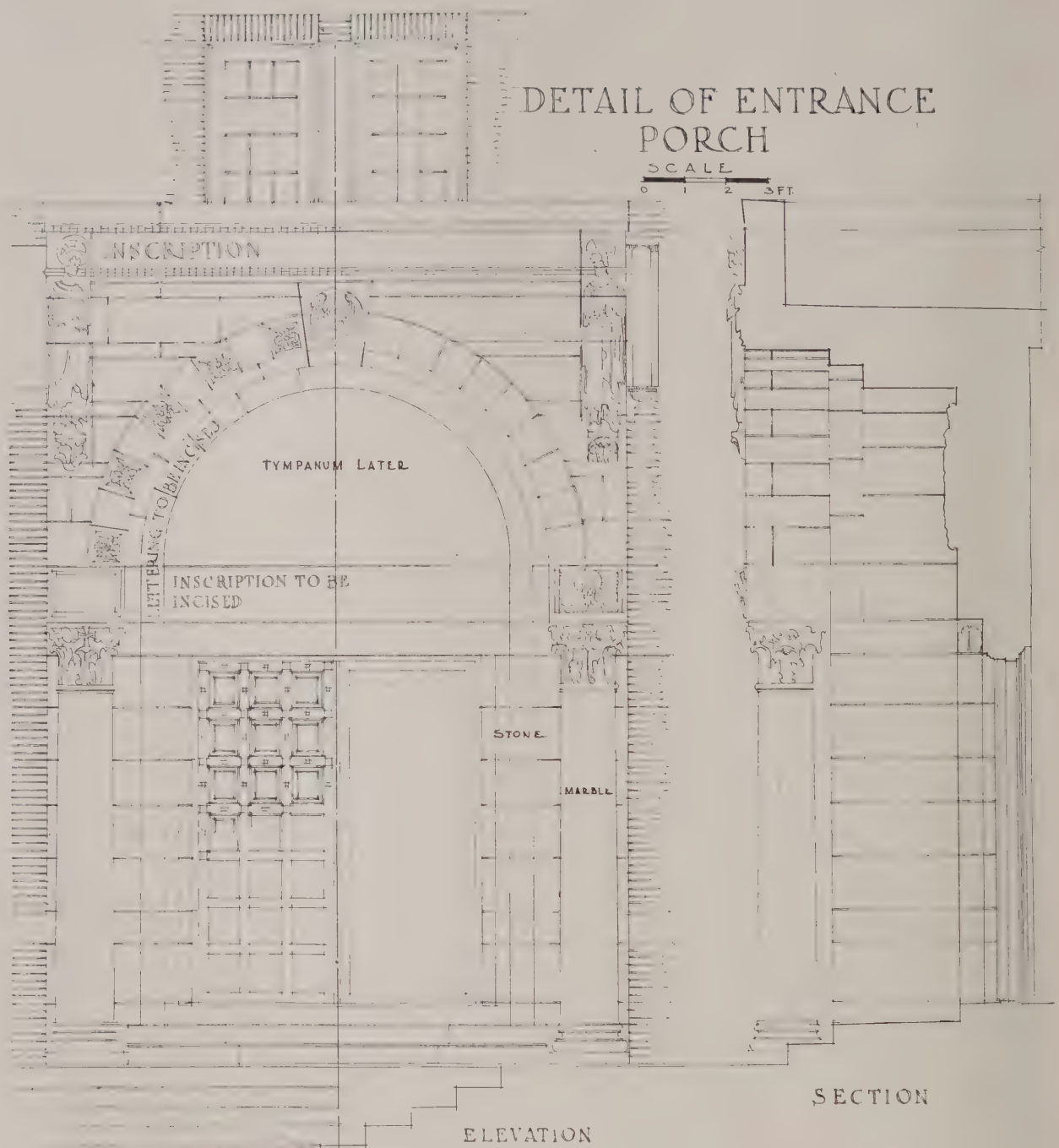
PLANS, NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS





THE MAIN ENTRANCE
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

Detail on Back



MAY
1928

NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

No.
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The ARCHITECTURAL FORUM DETAILS



ENTRANCE AT THE WEST END OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS



ALTAR AND BALDACHINO IN SANCTUARY OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

Detail on Back



DETAIL OF ALTAR

SCALE
0 1 2 3 Ft.

NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

MAY
1928

No.
68

The ARCHITECTURAL FORUM DETAILS

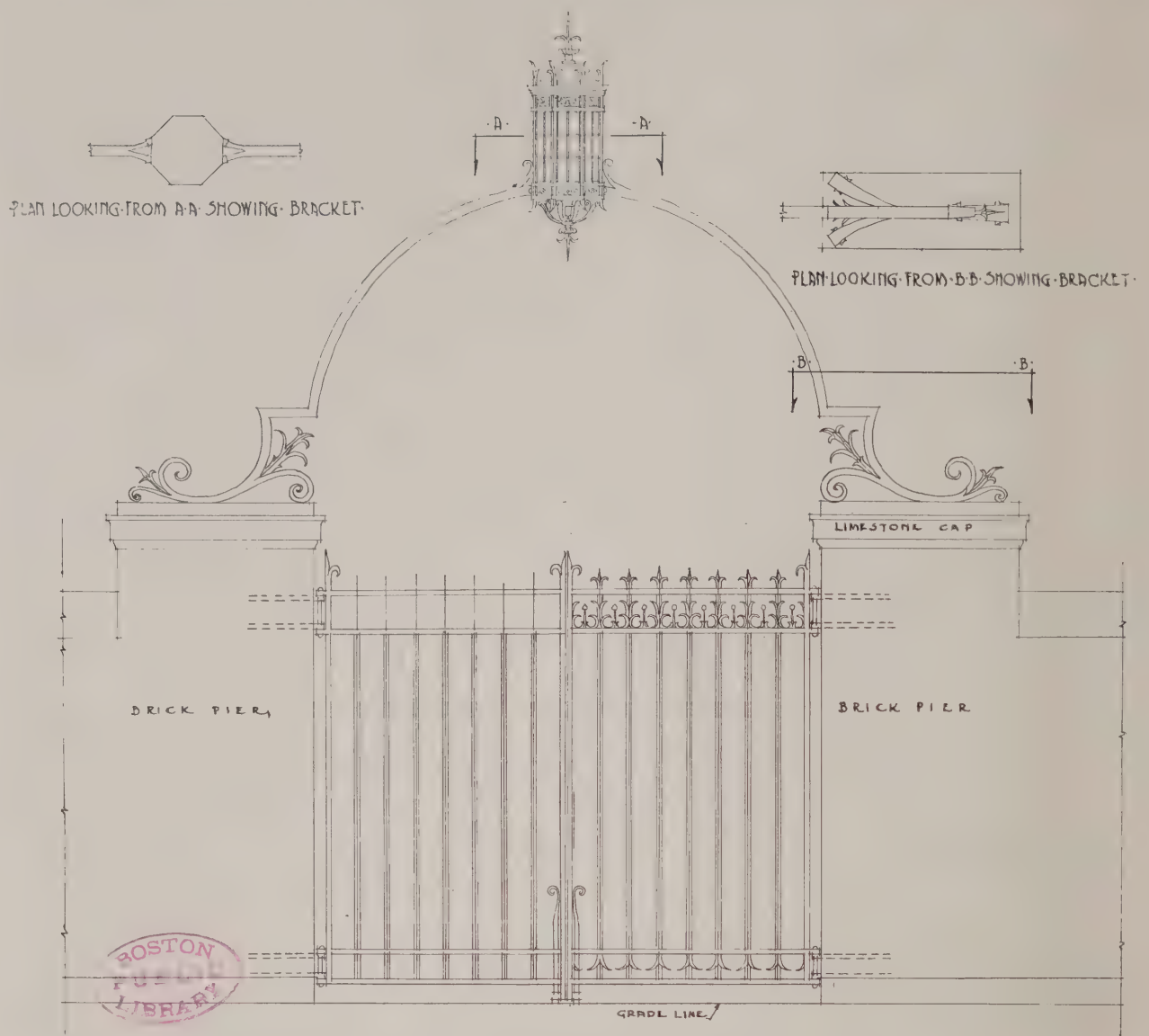


ONE OF THE CHAPEL BAYS
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

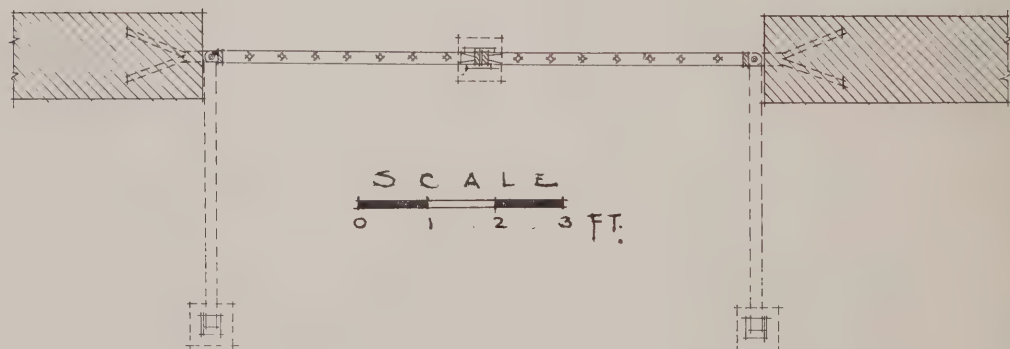


ENTRANCE TO THE WEST COURT
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

Detail on Back



ELEVATION OF CENTRAL GATEWAY IN WALL OF MAIN COURT



SECTION THRU GATE LOOKING DOWN

MAY
1928

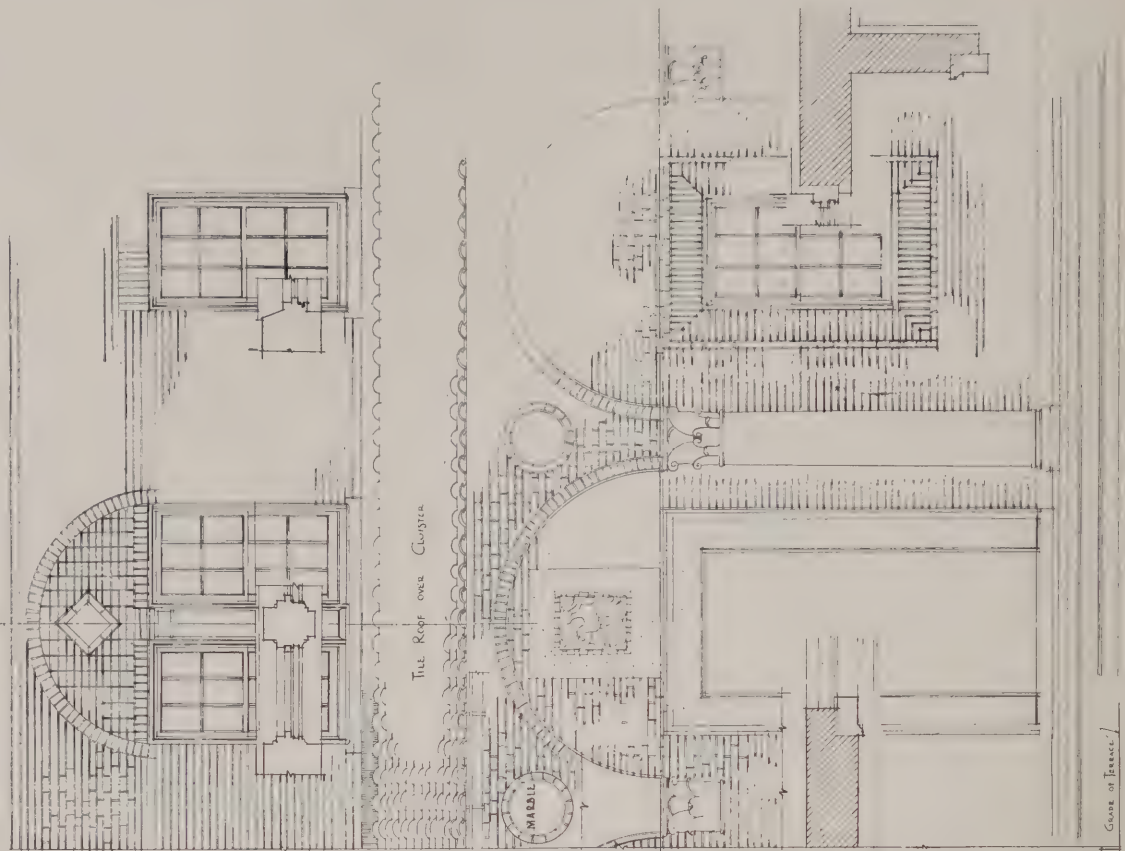
No.
69

The ARCHITECTURAL FORUM DETAILS



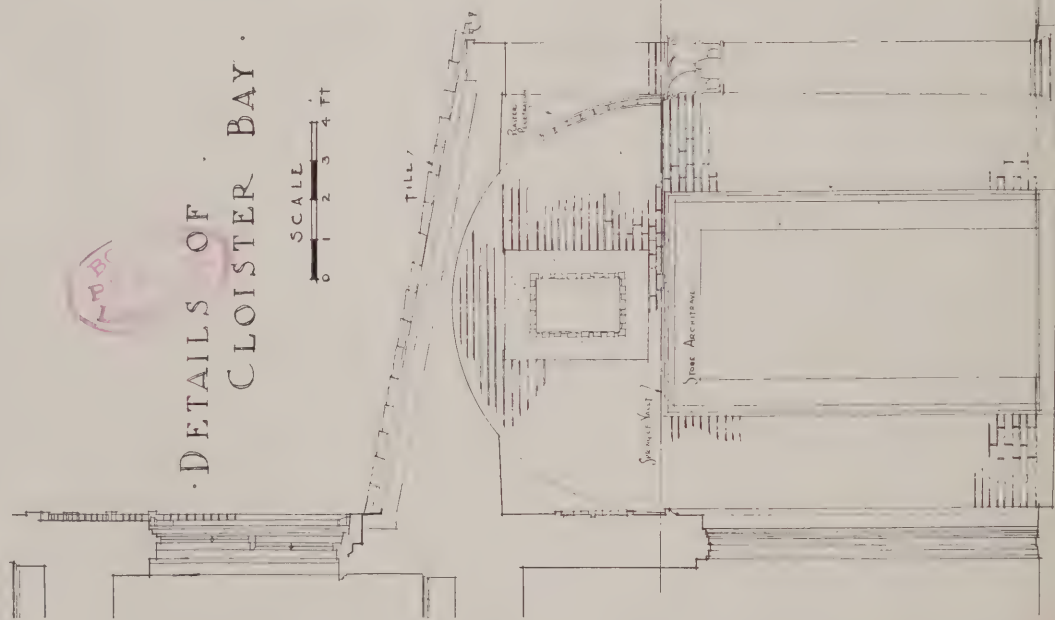
Detail on Back

ENTRANCE TO THE SACRISTY FROM THE EAST COURT
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS



DETAILS OF
CLOISTER BAY

SCALE
0 1 2 3 4 ft



NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

MAY
1928

No.
70

The ARCHITECTURAL FORUM DETAILS

Editor's Note: See Illustration on Page 635

THE DETROIT MASONIC TEMPLE

GEORGE D. MASON & COMPANY, ARCHITECTS

THE fact that the Detroit Masonic Temple has attracted the attention of architects and laymen throughout the country is primarily due to its having solved a most complicated problem; a result has been achieved which has architectural merit of a high order. To the fraternity it is a matter of interest that for the first time all Masonic bodies are housed in one building, requiring a structure containing 12,000,000 cubic feet, making it the largest and most complete structure of its kind in the world. Some idea of the complex nature of the problem may be gathered from the fact that there are 28 units in the building, providing for 50 Masonic bodies which must operate independently, and that in the aggregate a capacity crowd in each of these units amounts to 16,000 people. The large auditorium seats 5,000, the Consistory Cathedral 1,700, the Commandery Asylum 500, the Third Degree Auditorium 750; 6,000 people can sit down at one time in the various banquet and dining rooms and be served in 45 minutes, and the service varies from grill room a la carte to that of formal banquets. The divisional feature, which was imperative, was made to apply not only to the strictly Masonic portions but to rooms for club and social activities as well. Furthermore, it was necessary to correlate these various divisions that free and easy access may be had from one to another, should their joint use be found necessary on occasions when the attendance is unusually large.

The large general divisions comprise, at the left,

the tall portion, the Ritual Building, 14 stories in height, housing 26 Blue Lodge bodies; the Consistory; two Commanderies and five Chapters. In the center is the large auditorium, over which are the drill hall and armory; and on the right the Shrine Club, a building containing generous lounges, billiard rooms, natatorium, gymnasium, 100 guest rooms and a dormitory. It will be noted that there are two entrances to the Ritual Building, one for the Scottish Rite and the large entrance for the York Rite and Blue Lodge bodies. The majority of the Blue Lodge rooms have not been planned for large seating capacity, as it is found that for the first two degrees the attendance is seldom more than 100, but for the third degree the attendance would tax even those lodge rooms with a large seating capacity. A unique room, therefore, was prepared for this work on the top floor, having a seating capacity of 750. It is as if the south wall of a lodge room were removed and the spectators were outside looking in. The north wall of this lodge room opens on a stage where the dramatization of the third degree takes place. The interior of this room has not as yet been completed, although there will be need for it, as the memberships of the large lodges increase. It should make a very fine setting for the work. As the Consistory required a separate entrance to the building, so also it was required that its quarters be isolated from the rest of the structure during reunions; but it will be noted that at those times the banquet and ball



Greek Chapter Room



Corinthian Lodge Room



Red Cross Room



Gothic Lodge Room

room immediately below with parlors, etc., are accessible from their rooms by way of two stairways leading directly from the lounge and parlor of their quarters. Again, the Consistory lounge and parlor with their check rooms, etc. are available, with direct access to the large auditorium when this auditorium is being used for reunions and special gatherings. The Commandery Asylum has been planned with a church setting in mind, and due to its excellent proportions and stone treatment it forms an admirable background for the work of the Knights Templars. The Red Cross room and the Commandery parlor adjoin the Asylum and, easily accessible by means of ramps, are the armories and drill hall which are housed in the spans over the large auditorium. In connection with the armories are the dressing rooms and showers, which again give access to the natorium. This pool, with all its accessory features, serves also the gymnasium in the Shrine Club and is approached from the building on the same level.

An interesting feature of the large auditorium is due to the fact that the sight lines were determined by the proposed 70-foot apron extension to the stage, which when in use covers the permanent seating, as in a pit. This extension was to have been used during Shrine ceremonials. While this apron has not as yet been used, this sight line layout has given a quality of intimacy to the room which in itself is widely commented upon, and is indeed exceptional in a theater of this size. Two-thirds of the audience is visible to each spectator without turning around. This auditorium was planned primarily for the ceremonials of the Moslem Shrine, and the various rooms adjoining had reference to its needs, and these needs encroached considerably upon the lobby space which

for an auditorium of this size may appear inadequate. Yet the crowds are well handled, and the entire auditorium can be emptied in seven minutes. The stage is 55 x 110 feet in size, with a 65-foot proscenium. The Chicago Civic Opera Company gave Detroit a week of grand opera in this auditorium in February. Due in some measure to the form of the room, the low ceiling and the balcony arrangement, together with the use of acoustic material in some parts of the ceiling, the acoustics are perfect. It will be noticed that the rooms for social activities and the majority of the club features are, for obvious reasons, below the first floor level. The two large divisions are the two banquet and ball rooms, with their separate kitchens and serving rooms. The supper rooms in the basement are used for lodge banquets and may be thrown together to give any desired seating up to 1,200, and are served from the main kitchen. These rooms are accessible from the Shrine Club, which has no separate dining room or kitchen service. These basement rooms are in constant demand by the public as well as by different Masonic bodies, and the facilities for catering are such that it is now being planned to convert the trophy room into a cafeteria grill accessible from the elevator lobby. This feature, together with the grill room in the basement, will offer the casual diner a choice of service such as may be obtained only in a first class hotel. It may be mentioned that the two ball rooms are frequently used together, one being set up for banquets and the other for dancing, there being access from one to the other by two corridors.

The name "Temple" as applied to a Masonic building seems to stick, and has its origin possibly in the original tradition regarding King Solomon's Temple.



Crystal Ball Room



Commandery Asylum

However, in this case tradition was broken with, and the Detroit "Temple" would more appropriately be called the "Masonic Cathedral." The precedents for fraternal buildings are all in Greek or Egyptian. Nothing of the sort had been done in Gothic, yet the architects felt that this style best expressed the traditions of Masonry,—Solomon's Temple and the beautiful Scottish Rite Cathedral in Washington to the contrary notwithstanding. Certainly the spirit and tradition of the Knights Templars and the historical settings of the Scottish Rite are Gothic, and operative Masonry, having its origin in the guilds of Europe, has the tradition of the great cathedrals of which they were the builders. It was fortunate that this feeling was shared by the building committee, for to have attempted to clothe the complicated plan evolved after some three years of study with a classic facade, would have led to compromise and a result to be plainly labeled a fake. The flexibility of the Gothic is here very apparent, and certainly the result has justified the selection of this style.

The building, on a site 190 x 400 feet, crowds the lot lines, but fortunately it faces a beautiful park from which a general view is obtained. It dominates its surroundings, due more to its massiveness and general vertical feeling than to its size or height, which at the highest parapet is 210 feet. This massive effect has been obtained by the bold treatment of the stair towers, the deep reveals, and a silhouette of great interest and variety. The Gothic character has been carried out in the interior generally, although in the various lodge rooms the usual variation of styles has been observed. The small lodge room in decorated plaster is Romanesque. There is an Egyptian room, a Greek Doric, two in Greek

Ionic, a Corinthian, Italian Renaissance, Byzantine and Gothic. There being but ten lodge rooms, the orders were soon exhausted, although apparently for some reason the Composite was never considered.

The large auditorium has considerable detail adapted from the Venetian Gothic, and in the handling of the color decoration its character has been consistently carried out. While the general tone is gold, this has been enlivened with red and blue to produce a quiet richness of color seldom attempted in this type of work. Twenty-six rooms in all have been carefully studied, having in mind color decoration, which while never attempting the unusual has produced in every case results which are pleasing in their general richness and in harmony with the general character. The crystal ball room ceiling and the treatment of the concrete beams in the main entrance lobby are among the details which are interesting.

In the early stages of the development of the working drawings a carefully studied model at 3/16-inch scale was prepared. This was very helpful in the study of details, as slight modifications of moulded work and ornament were found advisable as the model was prepared. There are many sculptured figures on the exterior; eight at the top of the building measure 14 feet in height and represent guards and knights in armor. Those below over the main entrance, about 7 feet in height, were modeled by Friedlander and represent the three characters involved in the dramatization of the third degree. All of these figures were modeled at one-half full size. The symbolism of the order was introduced in the carving in the lower portions of the building and carries 40 or more different *motifs*. It is interesting to note that the lighting fixture contract called for

the greatest number of special fixtures of any building in the country. There is a great variety of styles, all well studied and in perfect scale. The two 8-foot diameter fixtures in the main auditorium are unusual in design and are relied upon to break up a flat ceiling. They have a jeweled effect, and with red, blue and amber on dimmers, a great variety of interesting lighting effects is possible. These fixtures were the work of the late Mr. Kinsman's organization, and its coöperation with the architects in every phase of work left nothing to be desired.

The selection of materials was governed to a large extent by considerations of economy and durability. Marble has been used extensively for floors, bases and stair treads, but limited to travertine, American verde antique and a Vermont gray. The woodwork generally throughout is of white oak, and the sand-

finish plaster is glazed. An imitation stone having remarkable properties of hardness was relied upon for textural effect in a great number of the rooms, and that the result is satisfactory is due entirely to the expert and painstaking work of the plasterer.

The final preliminary drawings for the building were approved in June, 1920. The first sod was turned on Thanksgiving Day, 1920, the cornerstone laid exactly two years later with 30,000 people witnessing the ceremony, and the building was finally dedicated on Thanksgiving Day, 1926. The long period of building was due to the policy of the committee of taking advantage of fluctuations in building costs and, insofar as possible, letting contracts only when the financial resources were sufficient for the period. This delay saved the association something more than \$1,000,000 over the original estimates.



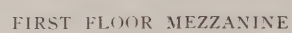
Main Auditorium, Detroit Masonic Temple
George D. Mason & Co., Architects



Photos. Thomas Ellison

Plans on Back

DETROIT MASONIC TEMPLE FROM CASS PARK
GEORGE D. MASON & CO., ARCHITECTS



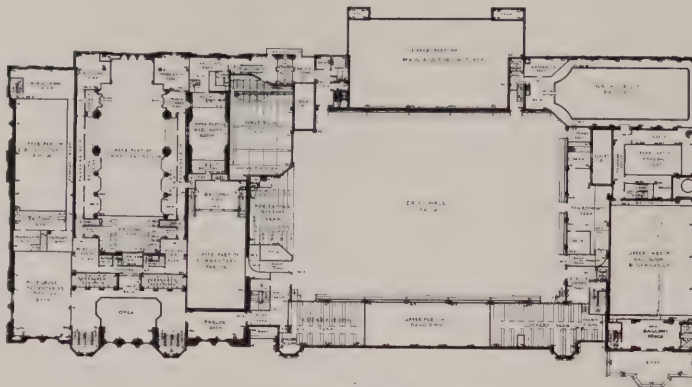
PLANS, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



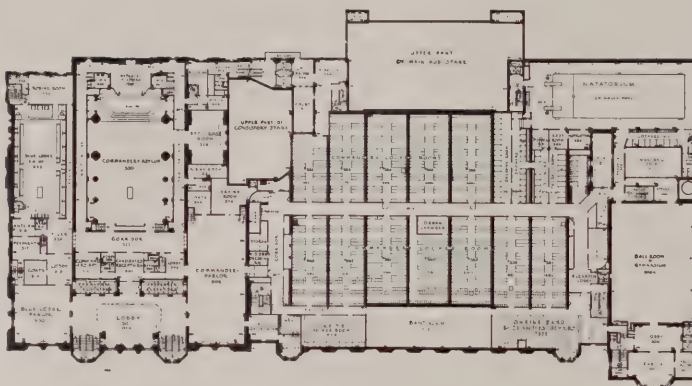


Plans on Back

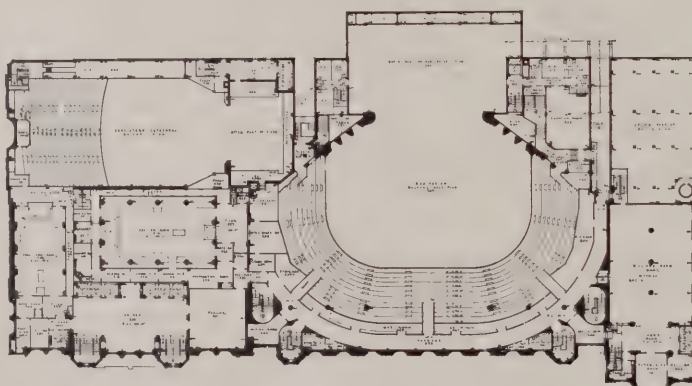
PART OF AVENUE FRONT, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



THIRD FLOOR MEZZANINE



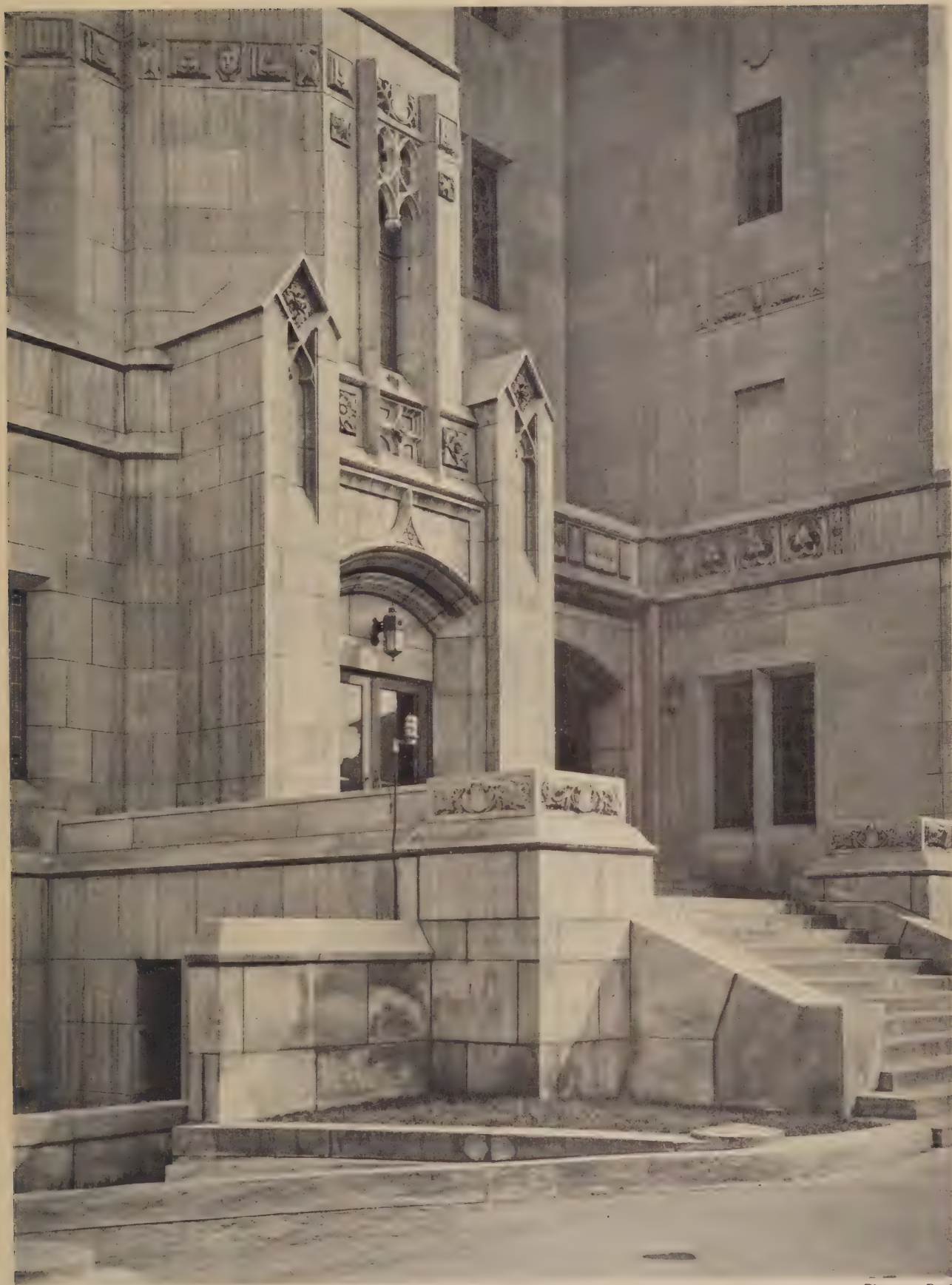
THIRD FLOOR



SECOND FLOOR

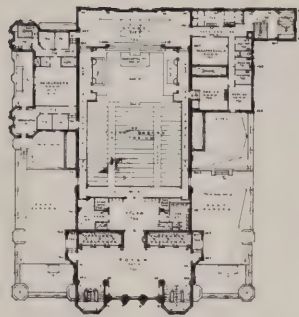
PLANS, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS





Plans on Back

ONE ENTRANCE TO AUDITORIUM, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



SEVENTH FLOOR



FIFTH AND EIGHTH FLOORS

PLANS, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS





ENTRANCE, MOSLEM SHRINE CLUB, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



ENTRANCE TO SCOTTISH RITE CATHEDRAL, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS

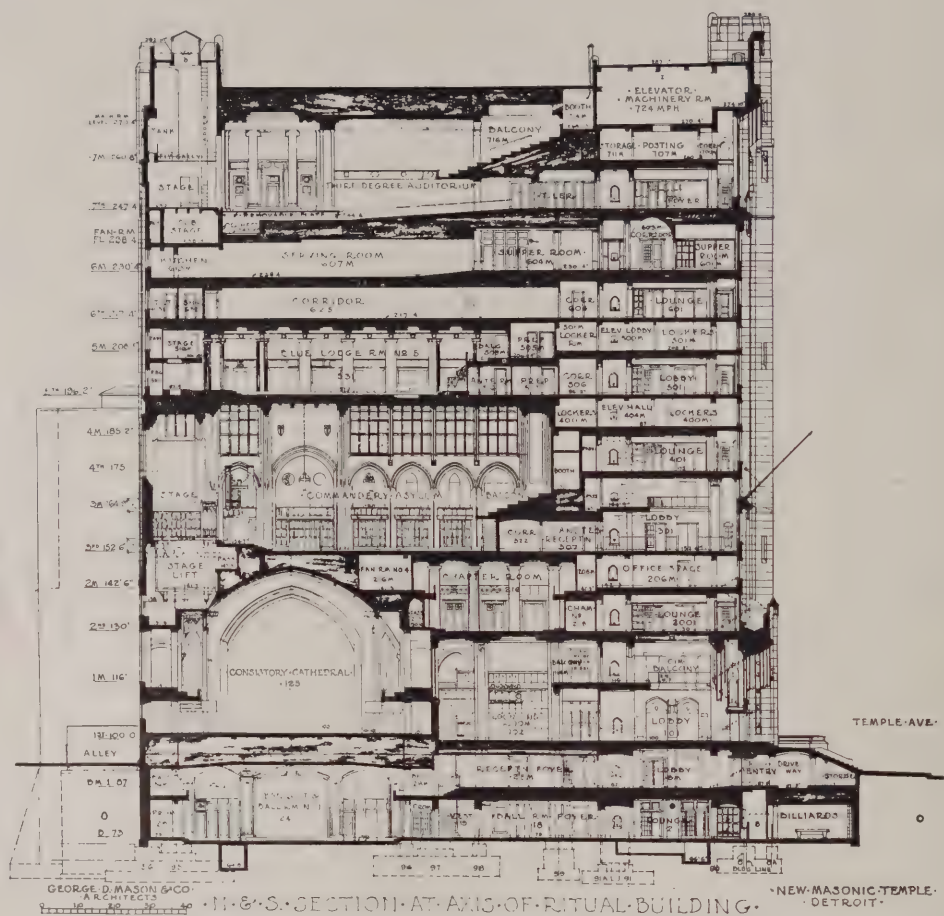


UPPER PART OF STAIR TOWER, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



Section on Back

COMMANDERY ASYLUM, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



NORTH AND SOUTH SECTION, DETROIT MASONIC TEMPLE
 GEORGE D. MASON & CO., ARCHITECTS



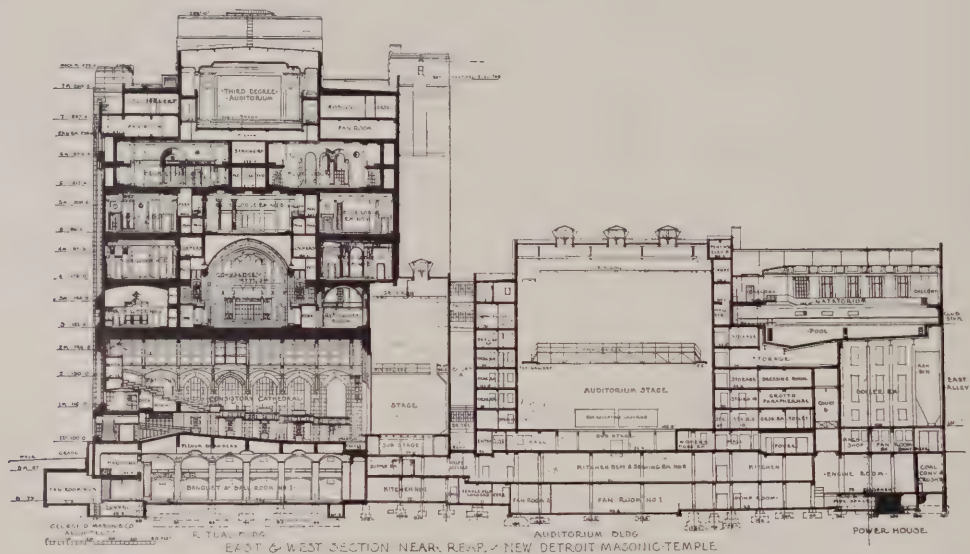


ONE OF THE LODGE ROOMS



ROMANESQUE LODGE ROOM, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS

Section on Back



EAST AND WEST SECTION, DETROIT MASONIC TEMPLE
 GEORGE D. MASON & CO., ARCHITECTS



THE BARBIZON

BY

MATLACK PRICE

MURGATROYD & OGDEN, ARCHITECTS

MIDTOWN New York is now so definitely a geographical location, and its vast building activity is spreading so rapidly that we may soon find it necessary to locate a given building in upper or lower midtown. Thus, with 42nd Street as the center, 63rd Street might represent at least the fringe of upper midtown New York, where at Lexington Avenue, is The Barbizon, a new towering club-hotel designed by Murgatroyd & Ogden. Its difference, socially, from hotels in general will be taken up later. Our primary interest, in any case, has to do with the architectural aspect of The Barbizon.

Seen from any point of view, it piles up well; its masses are vigorously and competently handled. The effect of four massive square towers at the corners, running well up the great central block of the building, gives the same strong, effective, vertical shadows that make The Shelton, farther down Lexington Avenue, one of the best buildings of its kind that our new architecture has achieved. The manner of The Barbizon, however, is a little different. Though The Shelton is Romanesque in detail, its total effect is that of an unusually rugged sort of mediævalism; and though The Barbizon is mainly Gothic in detail, its total effect is of a very Romanesque sort of Gothic. The utilization of large Gothic windows is ingenious as applied to this type of building, not only scaling well with the great masses and heights involved, but lending as well some feeling that might be called romantic,—romantic, certainly, as opposed to the mechanistic effect which some have seen as a possible æsthetic danger in the new architecture. The detail of The Barbizon has been managed economically yet adequately. Where incident was needed, it was provided, and with a simplicity of manner and an accuracy of scale revealing a careful and intelligent study of the whole project. In color and technique the brickwork is pleasing,—a range of salmon to light red, laid up with considerable diversity and trimmed with a neutral-toned limestone,—in all, a definitely worthwhile contribution to the number of great new

towers which now distinguish midtown New York.

As a "club residence for business and professional women and students of art, drama and music," one anticipates some expression of this within, some expression of the atmosphere of such a place,—and one finds that this has been secured in terms of excellent good taste. The only effect that could be called at

all elaborate, (and it is not at all overdone) is the Italianate treatment of the lobby and mezzanine,—the kind of transitional Gothic-to-Renaissance that came to France from Italy in the period of Francis I. Yet there is a quiet restraint in the handling of it here, in a manner befitting the entrance of an important building. From the northwest corner of the mezzanine, two steps lead down into a pleasant library, done with charm and simplicity. The dining room, which opens from the main floor of the lobby, is done in an Adam treatment and proportioned and scaled, one would say, to provide quiet and intimacy for the guests rather than to inspire the "delusions of grandeur" that constitute the chief attraction of those hotel dining rooms that are carried out "in the grand manner." A large solarium or lounge,

furnished in admirable taste, is located on the west side of the nineteenth floor, and above this there are attractive rooms for a number of the college clubs.

A study of The Barbizon cannot but remind one of the extraordinary advance in good taste represented today by buildings of its type. Architectural design *per se*, a more intelligent use of materials, ever-increasing efficiency in fixtures and equipment, quiet good taste in furnishings,—all contribute to the creation of a new type. It is seen not only in the newest hotels and apartment houses, but in office buildings, and even in railroad stations. Unlike the Bourbons, who have been said to "learn nothing and forget nothing," architects have learned a vast amount, even during the past ten years, and have forgotten, happily, much that merely cluttered up buildings and made against good taste and utility alike. The Barbizon seems to give evidence of a new understanding of civilization, wholly convincing



The Barbizon, New York
Murgatroyd & Ogden, Architects

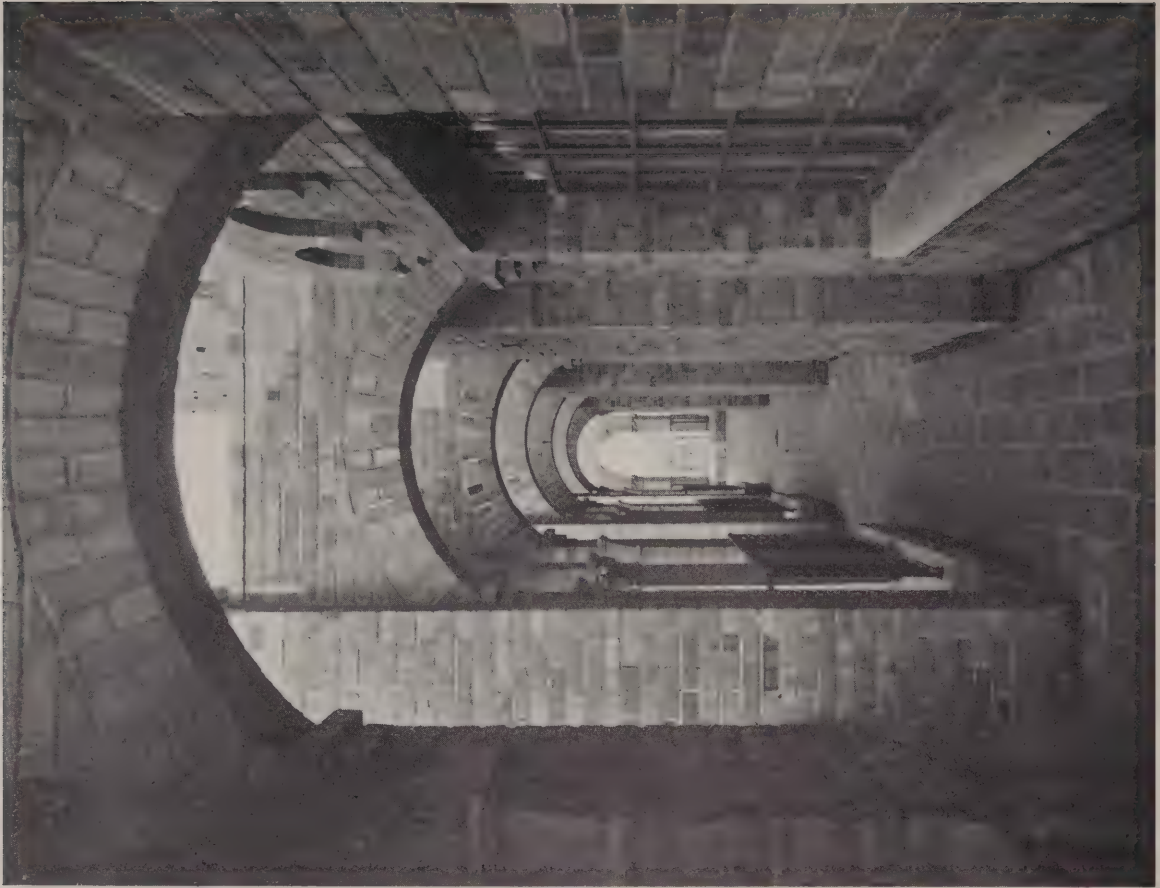


Photos. S. H. Gottscho

ROOF GARDEN ARCADE, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



ARCHES AND BALCONIES, EIGHTEENTH FLOOR, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



ROOF GARDEN WALK



BALCONY LOUNGE

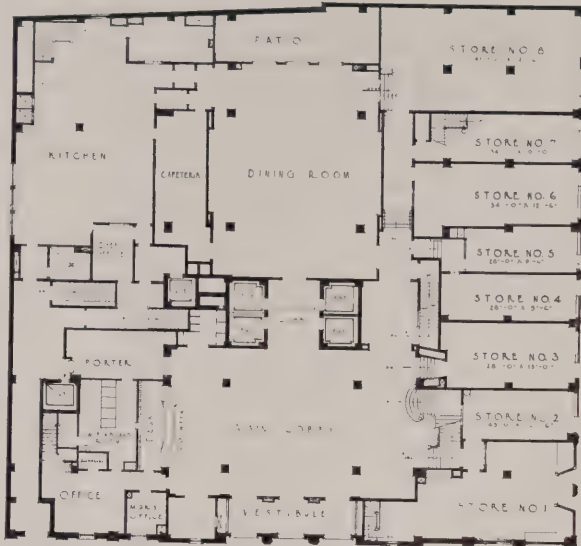
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



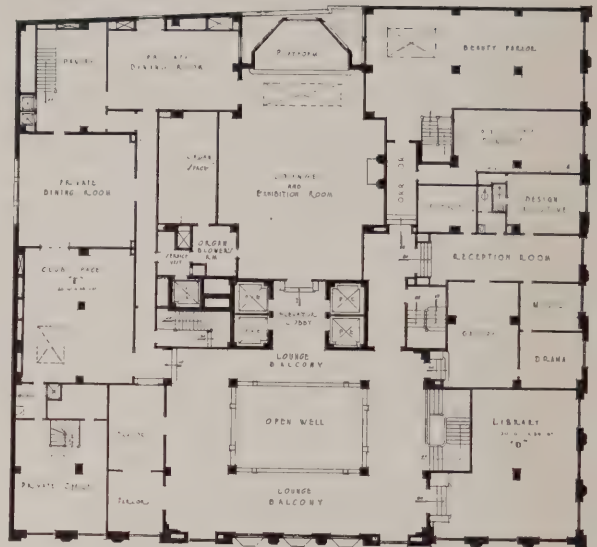
Photos. S. H. Gottscho

Plans on Back

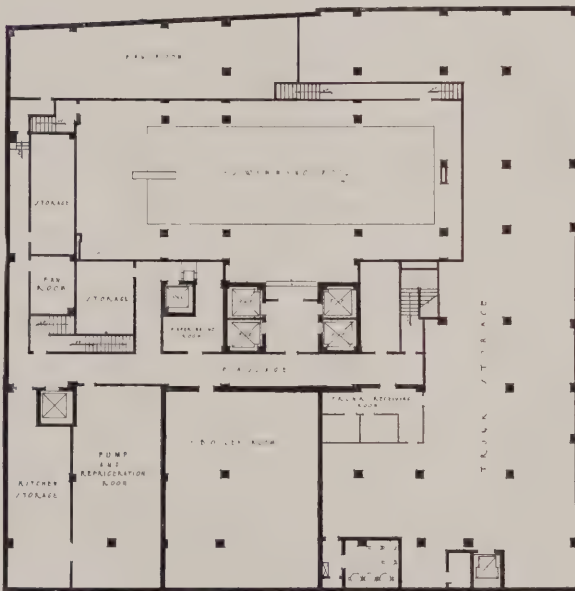
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



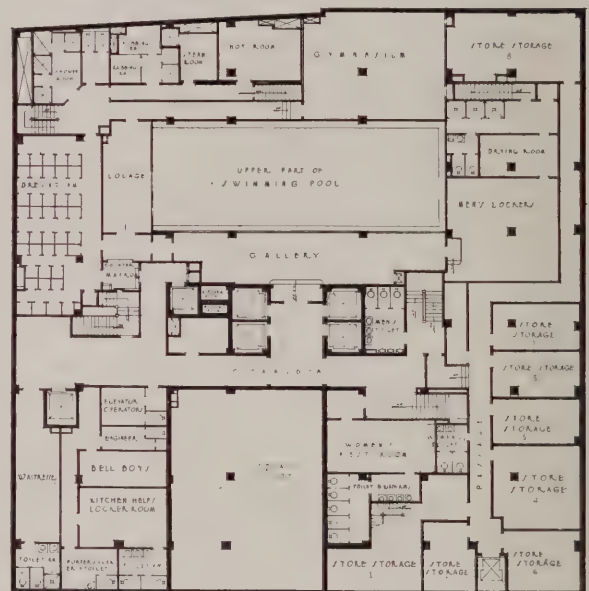
FIRST FLOOR



SECOND FLOOR



SUB-BASEMENT



BASEMENT

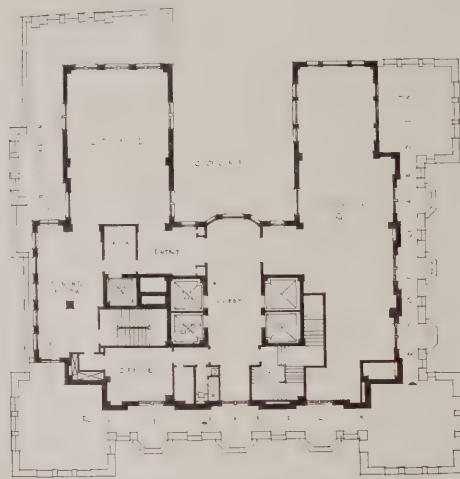
PLANS, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS





DETAIL OF LOWER STORIES
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

Plans on Back



EIGHTEENTH FLOOR



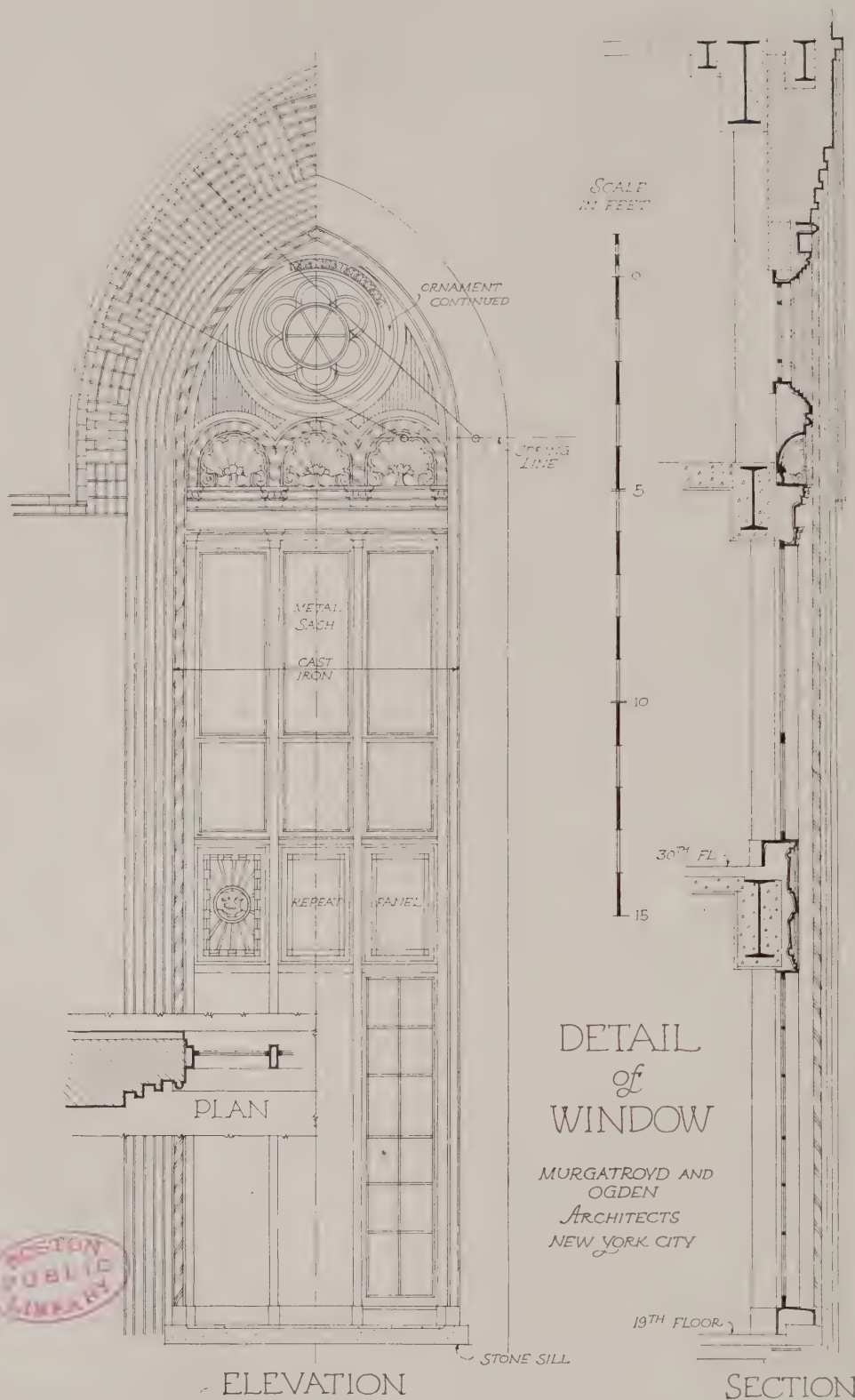
TWENTIETH FLOOR

PLANS, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



DETAIL OF UPPER STORIES
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

Detail on Back



MAY
1928

No.
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The ARCHITECTURAL FORUM DETAILS



Detail on Back

MAIN ENTRANCE
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



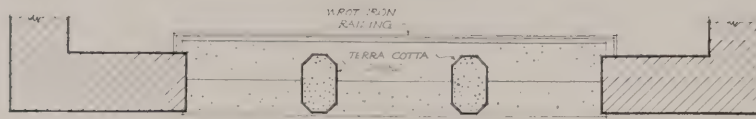
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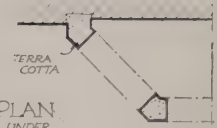


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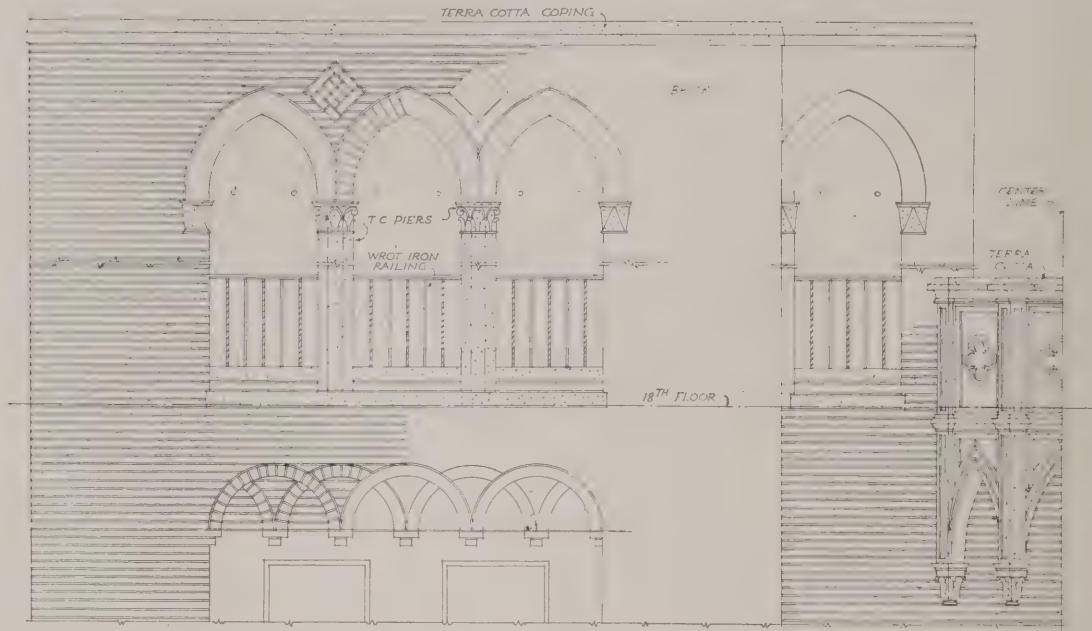
LOGGIA ON THE EIGHTEENTH FLOOR
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



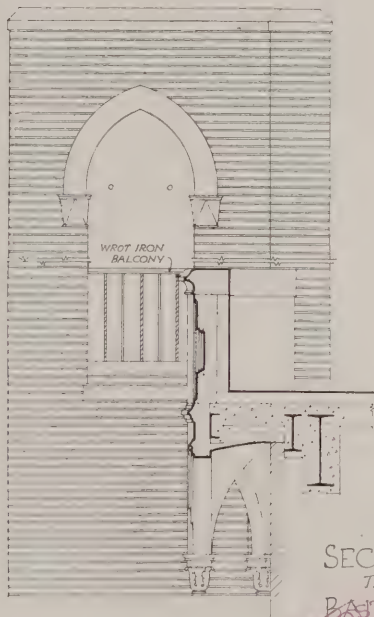
PLAN OF LOGGIA



PLAN UNDER BALCONY



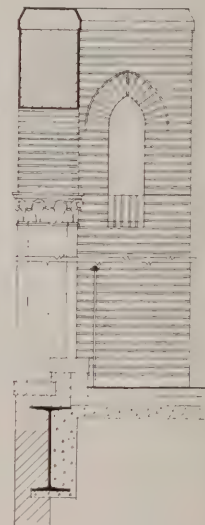
ELEVATION



SECTION THRU BALCONY

DETAILS AT PARAPET....

MURGATROYD AND OGDEN
ARCHITECTS
NEW YORK CITY



SECTION THRU LOGGIA

SCALE IN FEET



MAY 1928

No. 73

The ARCHITECTURAL FORUM DETAILS

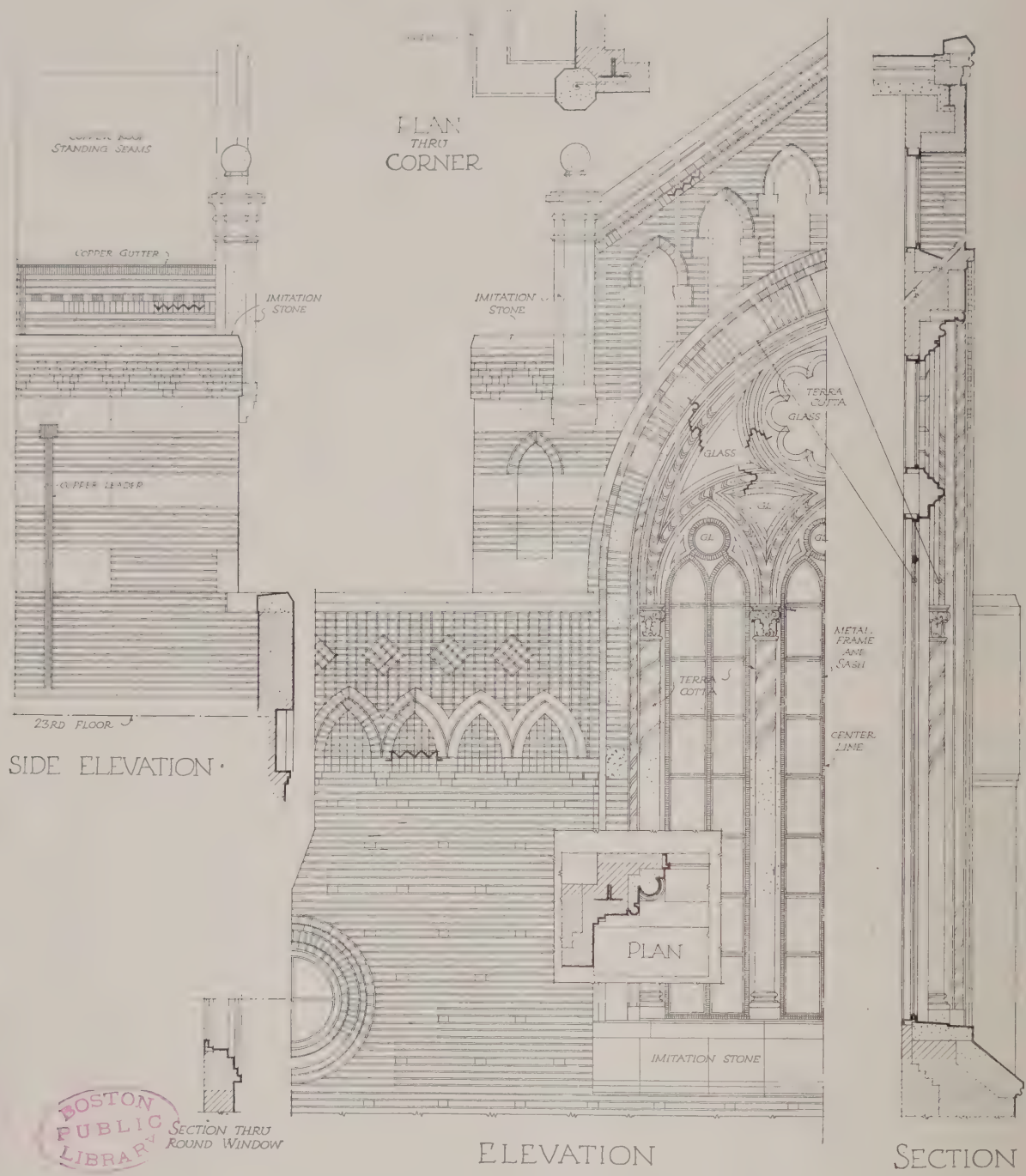


LOUNGE AND EXHIBITION ROOM



Detail on Back

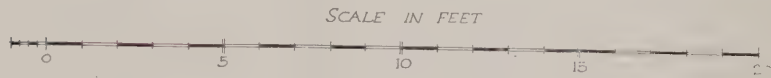
MAIN LOBBY
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



DETAILS OF DORMER

MURGATROYD AND OGDEN ARCHITECTS, NEW YORK CITY

MAY 1928



No. 74

The ARCHITECTURAL FORUM DETAILS



Photos. John Wallace Gillies, Inc.

Plans on Back

ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS



PLANS, ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS

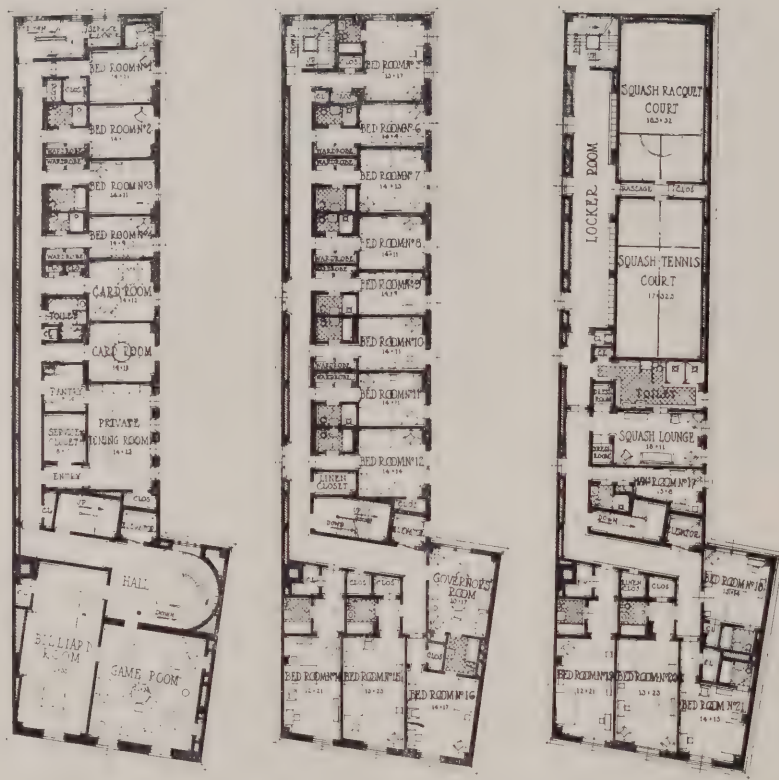


THE LOUNGE



MAIN DINING ROOM
ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS

Plans on Back



· THIRD FLOOR · · FOURTH FLOOR · · FIFTH FLOOR ·

PLANS, ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS



PHI DELTA THETA FRATERNITY HOUSE UNIVERSITY OF VERMONT

BY

WILLIAM McLEISH DUNBAR, ARCHITECT

THE pleasant dinner may be—much food and little speaking, the successful game—many plays and little argument, the enjoyable article—many pictures and little writing. If so, this presentation of Vermont Alpha's new house is doomed. The architect has been asked to describe it. He would like to make a matter-of-fact statement that it contains 25 rooms, all of course arranged in the most practical manner of construction in the most economical fashion, but he feels that the important feature of the new house is not to be found within its own walls, but that it comes, rather, from the atmosphere of the beautiful town and country which are spread about it.

Burlington, in Vermont, should be known rather than seen, yet outwardly it could scarcely be a more appealing place, overlooking Lake Champlain, with stately mountain ranges on each side,—the Adirondacks and the Green Mountains,—and over all the glittering northern air and sunlight. One feels in Burlington the beauty of its long New England history. It bears the marks of early war and of early peace and culture. It has the battery of queer, ancient guns; the University whose cornerstone was laid by Lafayette; and its elmed streets of fine old houses. When Edward Everett Hale visited the place he said: "Those of you who have been in Burlington will know that I was in a city of palaces."

But everything typical in Burlington has the simplicity, dignity and integrity of Vermont, qualities well symbolized by the marble and granite for which the state is famous. These "palaces" of Dr Hale's were the old homes built during the first half of the nineteenth century by the prosperous New Englanders who were the product of the old town. Like all buildings of real architecture, these homes were typical of their owners. They were built in the mannered dignity of the Greek Revival, a style eloquent of simplicity, dignity and classic culture. From the subtlety of this period come beauty and attraction even beyond the appeal of the more obvious styles which more often command attention. Such, then, is the atmosphere of the locality in which a twentieth century fraternity wished to build a chapter house, a structure to accord with its surroundings.

The committee which directed the building of the house at the University of Vermont from the beginning had in mind a simple, substantial house rather than one more spectacular. They were also desirous of following a further propriety; wherever possible they wished to use native materials and articles of local craftsmanship. So it is that the exterior walls are constructed of beautiful crystalline marble, which was freighted to Burlington from the Vermont quarries at Proctor. This stone is bril-



Entrance Front, Phi Delta Theta Fraternity House, Burlington, Vt.



DINING ROOM

PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.
WILLIAM McLEISH DUNBAR, ARCHITECT



SMOKING ROOM
PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.
WILLIAM McLEISH DUNBAR, ARCHITECT



Niche in Chapter Room

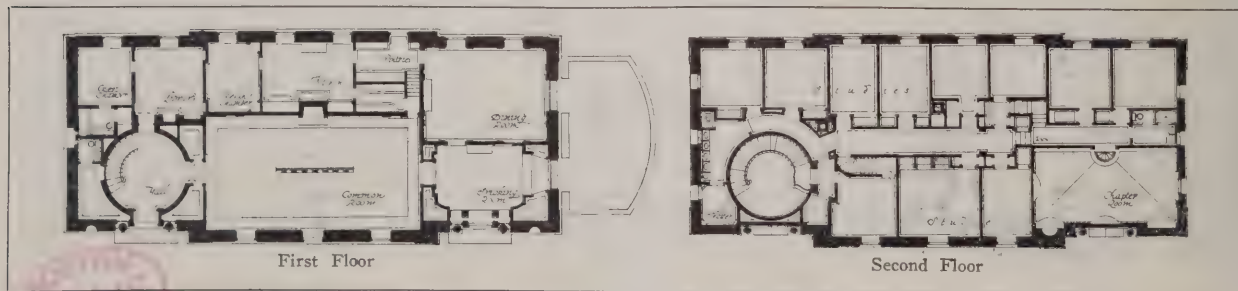


Library Chimneypiece

liantly white in the sun, but is relieved from glare by a delicate veining of green. The blocks are laid in the wall in an irregular bond and with joints of varying widths, so that there is not an impression of too great formality. It is often amusing to use an exquisite material carelessly. For trimming, white marble was used with a sanded surface, and in certain places it was carved in Greek design. The roof is of Vermont green slate, and together with the window blinds and white walls it carries out the old fashioned color scheme of green and white.

The site is at the head of College Street, which makes a gradual ascent of 300 feet from Lake Champlain to the University. Under the continuous arch

of lofty elms, there is almost the air of a dim cathedral nave. The new house stands slightly above the curb level, facing north. Because of this orientation most of the windows were put at the rear, and those rooms which do not require sunlight were placed fronting the street. In the center portion is the music room; in the wings, the two-storied entrance hall and the domed chapter room, both lighted from above. This arrangement makes possible the use of very large doors and windows, which increases the effect of simplicity, but, however, makes the house look smaller in the accompanying illustrations than it really is. Although not actually large, an indication of its size may be had



Phi Delta Theta Fraternity House, Burlington, Vt.
William McLeish Dunbar, Architect



Entrance at the East End



Terrace at the West End

from the lower windows and door, which are 12 feet high. A further individuality is due to the unusual material. Aside from the federal building, there are no marble structures in Burlington. The entrance door is in the east wing and bears above it a tablet inscribed "1848." The tall leaves of the outer door are pivoted and fold back into the thickness of the wall without showing unsightly hinges. The hall is a circular, severely simple room, dimly lighted by a high skylight. The solidity of the building is noticeable here. The walls and conical ceiling are gray plaster, the self-supporting stairway is of marble of a warm tan color, and the floor is rough tile of the same shade. The border around the base of the wall and up the stairs is of blue faience. The moulded door casings are painted white, and the openings are filled with quaint blinds. The principal feature of the hall is the stair rail, which rises in an unbroken spiral. It was wrought by hand, the work of an old time craftsman. At the left of the hall are coatroom and lavatory, and directly beyond is the library. The finish of this room is of wide planks of varying widths laid horizontally on the walls from floor to ceiling, being a less formal treatment than wood paneling. The walls are painted

an antique green, and the mouldings, trim and cornice are dull carmine. The high ceiling is old gold. All these colors tone together in such a way as to form a restful background enlivened only by the curtains and chair covers of gay English chintz. The chimneypiece is also of English origin, at it was taken from an old London house. Its carving has the charm for which the eighteenth century craftsmen are noted. A secret door leads from this library to the guest bedroom, beyond which is a tiled bath. The entrance to the large room of the house is also from the circular hall. Here also the paneled doors fold back on each side, giving the impression of there being a very thick wall. This room is a general lounge. Its dimensions are 44 feet by 22 feet. The walls and ceiling are gray plaster with a classic cornice in pure white. At the base of the wall is a mosaic dado in a Greek pattern in black, gray and blue. The principal decorations of this room are the long curtains patterned in a Directoire design in blue, gray and apricot. The floor is left bare of rugs and is of selected Vermont birch divided into squares by inlays of black wood. As yet the fireplace wall is undecorated. A specially modeled plaque of the fraternity's goddess from the classic model, "the



Card Room in Basement



Card Room Fireplace



WINDOW IN SMOKING ROOM



DOOR IN COMMON ROOM



THE ENTRANCE



A TYPICAL DOORWAY

PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.
WILLIAM McLEISH DUNBAR, ARCHITECT



SMOKING ROOM WINDOW



CHAPTER ROOM DOOR



TERRACE WINDOW



CIRCULAR STAIRS

PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.

WILLIAM McLEISH DUNBAR, ARCHITECT

Pensive Athene," is to be set into the wall and bordered by scarlet and gold tiles, and the whole wall decorated by hand after the manner of the Directoire period. Beyond the large room or lounge is the smoking room with the house manager's office and filing closet adjoining. Next and at the rear, overlooking lawn and tennis court, is the dining room. This is a high-ceilinged room modeled after an old hall at Harvard. The planked walls are painted pale green and are relieved by fluted wood pilasters painted antique white. The huge windows are curtained in a violet colored material, and the specially designed furniture is the golden color of old maple. Twenty men eat at one long table, and there are additional tables which may be joined to this to make an H-shape. The service department is at the rear. The most obviously attractive room is the card room in the basement. Here it was decided to leave subtlety behind and make a "rough house" room. The walls are crudely half-timbered, with the rough plaster peeling off in places and so showing the brick beneath. The ceiling is beamed with adzed timbers, these being over a century old. They are a relic from the last chapter house. The fireplace is of rough red sandstone with a high hearth. The floor is cement. The color of the room is rather harsh,—dark brown timbering, cream colored plaster, orange shutters; and the oak doors, 2½ inches thick, are stained in orange, emphasizing the grain of the wood.

Students at the University of Vermont must either have their homes in the state or be descendants of alumni. Consequently the registration is but 1100, and the fraternity chapters are small. On the second floor of the house there are ten studies, each

for two men only. There is also a segregated room for the house matron. The hall of this floor is more than a passage in that it is ample and symmetrically arranged, with the room doors set in deep recesses. The studies are designed and furnished as carefully as the rest of the building, for they are the most important element in any fraternity house. These rooms are divided into three sections and are cut off from the main hall, this is to insure quiet. The walls are finished in rough gray plaster of very pleasing texture. The elaborately moulded door casings with their pedimented tops serve as relief to the plain plaster. The doors themselves are of beautifully matched gumwood. Old fashioned box-locks of polished brass are mounted on the faces of the "lockrails." Each man has a wardrobe or dresser, with a conveniently located electric light, all built into the wall and shut off from the study by a door. The desks are modeled after the old fashioned slant-top type, and the study chairs are comfortable Windsor. In addition there are upholstered chairs covered in bright cretonne matching the long window curtains. There are no desk lamps, the lighting being by iron floor lamps with parchment shades. The rugs are of the same material throughout, but of different colors. At each end of the second floor are stairs leading to the dormitory above, and nearby are tiled bathrooms. One of these connects with an octagonal shower room, completely waterproofed.

There is always something particularly appropriate in the use of the Greek Revival type of architecture for a fraternity house, and here use of the type brings the building into close accord with its surroundings,—with other houses of the same general character.



Common Room Chimneypiece, Phi Delta Theta Fraternity House, Burlington, Vt.

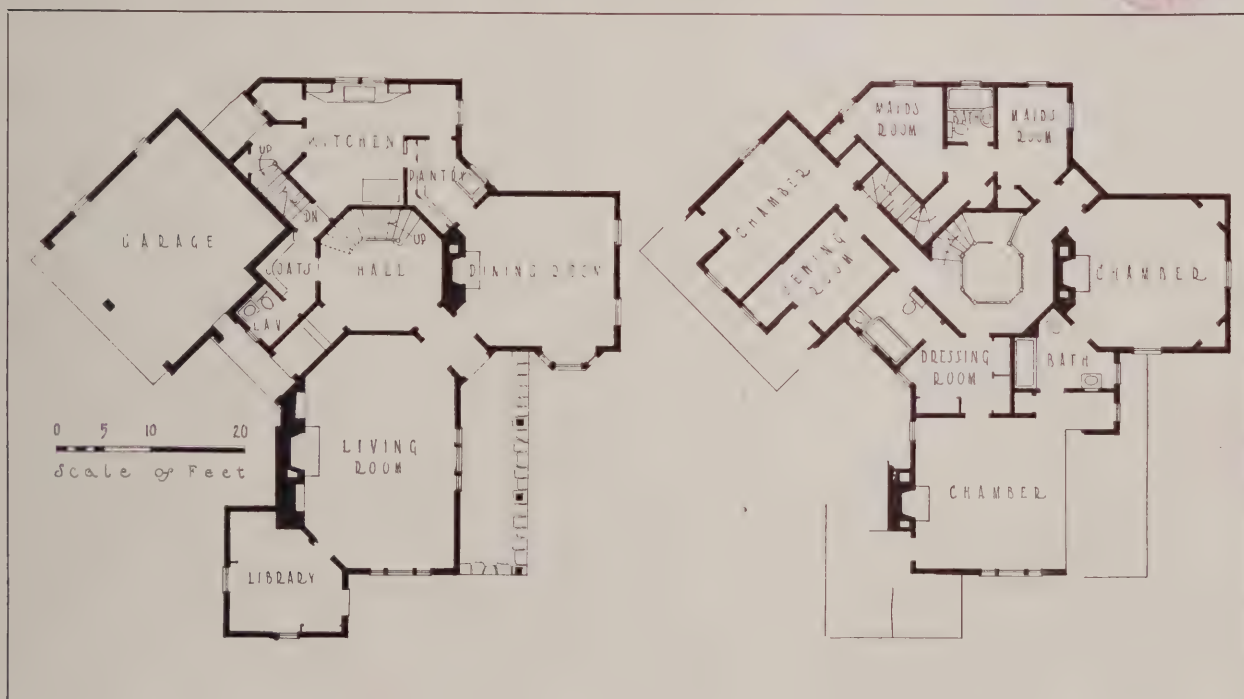
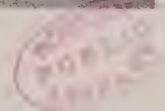
William McLeish Dunbar, Architect



SMALL BUILDINGS



HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT





LIVING ROOM END, HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.

J. ROBERTSON WARD, ARCHITECT

A PLAN more unsymmetrical and ingenious could hardly be imagined. Grouped about a center octagonal stair hall, the various rooms are so placed that they form an irregular Maltese cross. No particular balance or definite arrangement seems to have governed the layout of the plan. One advantage of this peculiar form is that the principal rooms can have windows on three sides, although this opportunity was not taken advantage of, probably for the reason that too many windows cut up wall areas and detract from the sense of privacy and seclusion which the principal rooms in a small country house should always possess. The fact that three of the corners of the living room are cut off adds to rather than detracts from the architectural effect. The paneled chimney breast, devoid of any mantelpiece or shelf, with the built-in book cases on either side, is an attractive and well designed feature of the living room. A little library or office opens off one end of the living room, making a convenient and comfortable place for quiet and privacy. The dining room is considerably smaller than the living room, and with the exception of the small bay window on one side is symmetrical in plan, as the fireplace at the center of one end of the room is balanced by doors on each side. The many angles of this plan

produce strange shaped spaces which are occupied by the pantry, coat closet, lavatory, and passageways. The kitchen, which is most irregular in shape, has, however, sufficient floor area to accommodate its requirements. Although the garage is definitely set into one angle of the house, it is reached only through a door opening onto the entrance porch. The octagonal stair hall, which is shown in an accompanying illustration, with its white painted walls and the black painted newels and hand rails, has almost the effect of a modernistic French design. On the second floor there are two good sized master bedrooms, two master baths, a sewing room, small guest room, and two maids' rooms and a bath. Necessarily, these rooms are similar in their irregularity of shape to the rooms on the first floor.

This house, which was completed in 1925, contains about 54,000 cubic feet, costing a little over 46 cents per cubic foot, or approximately \$25,000. The roof is covered with $\frac{1}{4}$ -inch green slate, and for the gutters, conductors and flashing copper was used; 24-inch shingles laid 10 inches to the weather cover the outside walls. All of the floors are of oak, except in the kitchen and baths, where rubber tile was used. Brass pipe was used throughout all the plumbing, and white wood for the trim and paneling.



LIVING ROOM



DINING ROOM

HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT



OCTAGONAL STAIR HALL, HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT

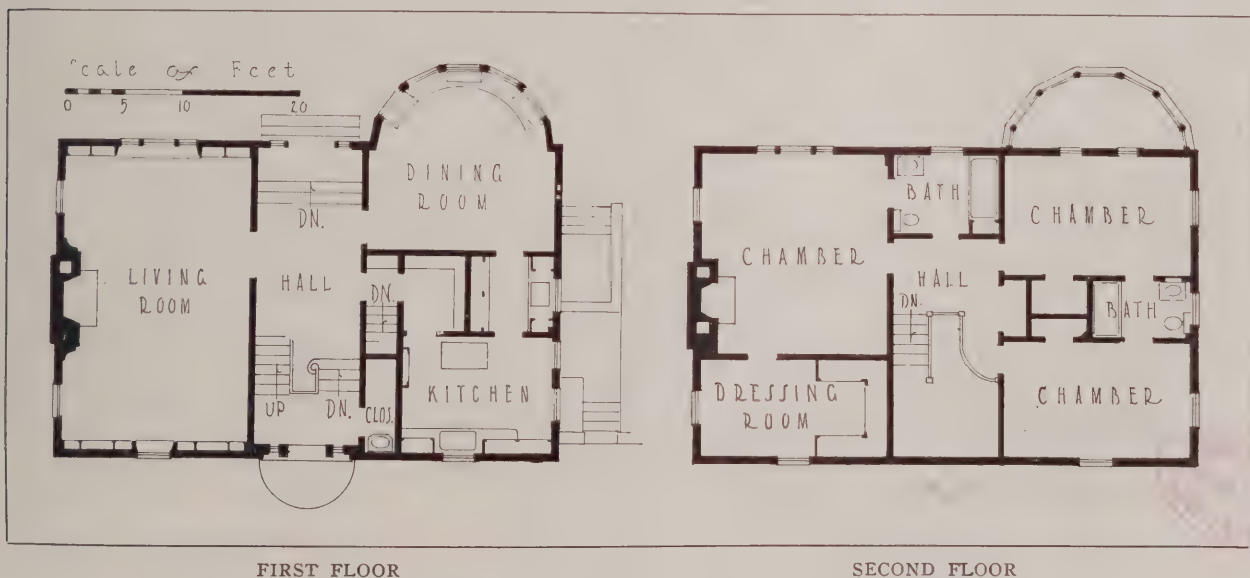


HOUSE OF GEORGE MACOMBER, ESQ., CAMBRIDGE, MASS.

J. ROBERTSON WARD, ARCHITECT

THE chief characteristic of this symmetrical small house is its unusually large and monumental entrance door, which opens upon a landing of the main stairway, midway between the first and second floors. This peculiar location of the entrance door, due to the sharp drop in grade of the lot on which the house is built, makes it possible to keep the front elevation of the house attractively low in height and simple in design. Four well placed win-

dows balance this entrance door at a sufficient distance from it to allow the door to completely dominate the design of the main facade. The rear elevation has a pleasingly homelike quality, due largely to use of the large bay and several grouped windows. The usual wood frame construction was used, wood clapboards for the walls, and $\frac{1}{4}$ -inch green slate for the roof. Containing 38,000 cubic feet at 45 cents, this house cost completed, 1926, about \$17,000.



FIRST FLOOR

SECOND FLOOR



SOUTH ELEVATION



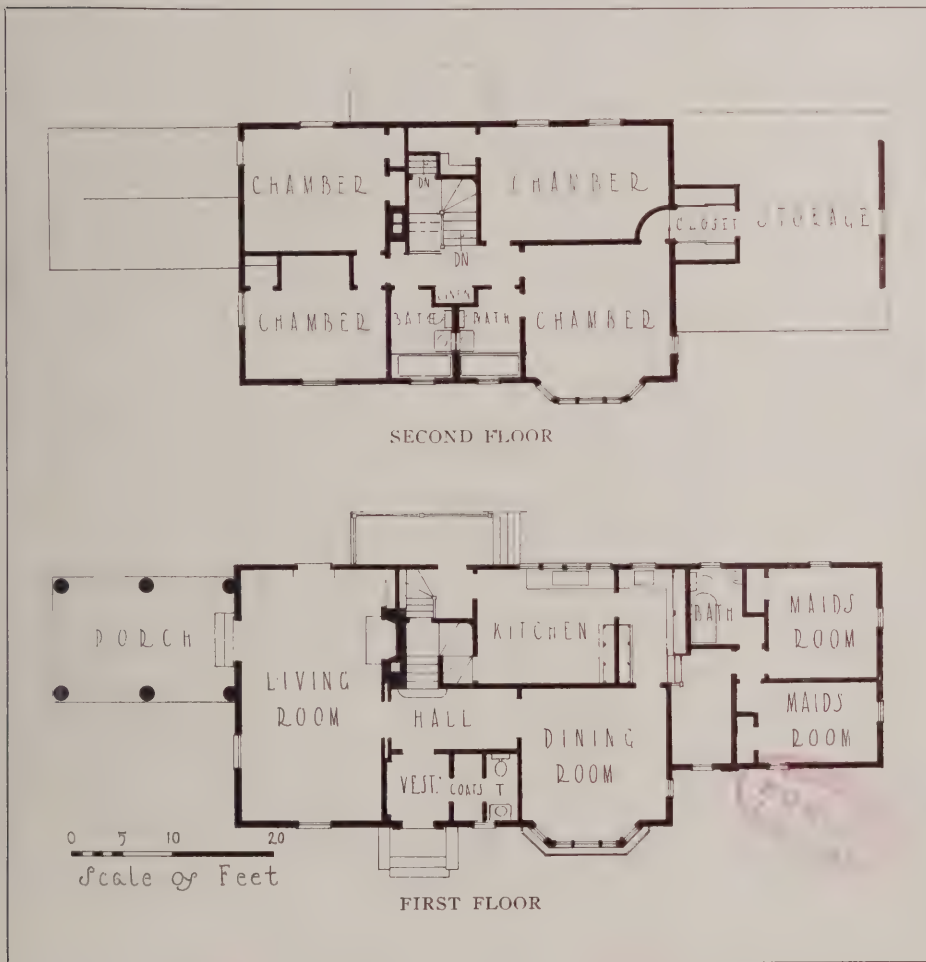
LIVING ROOM

HOUSE OF GEORGE MACOMBER, ESQ., CAMBRIDGE, MASS.

J. ROBERTSON WARD, ARCHITECT



HOUSE OF DR. WILLIAM M. SHEDDEN, CHESTNUT HILL, MASS.
J. ROBERTSON WARD, ARCHITECT



THIS is a variation of the New England farmhouse type. 24-inch shingles, laid 10 inches to the weather and stained gray, cover the walls, and $\frac{1}{4}$ -inch green slate is used on the roof. The two-car garage is conveniently located in the service wing, under the two maids' rooms and bath. Off of the large entrance vestibule a coat closet and lavatory are conveniently located. The center stair hall connects the dining room with the living room. Four master bedrooms and two baths are located on the second floor. The two-story bay window on the front of the house adds to its homelike and cheerful character. Two-story bay windows give distinction and quality. They are as appropriate on houses of old English design as on those in Colonial and the later Georgian styles.



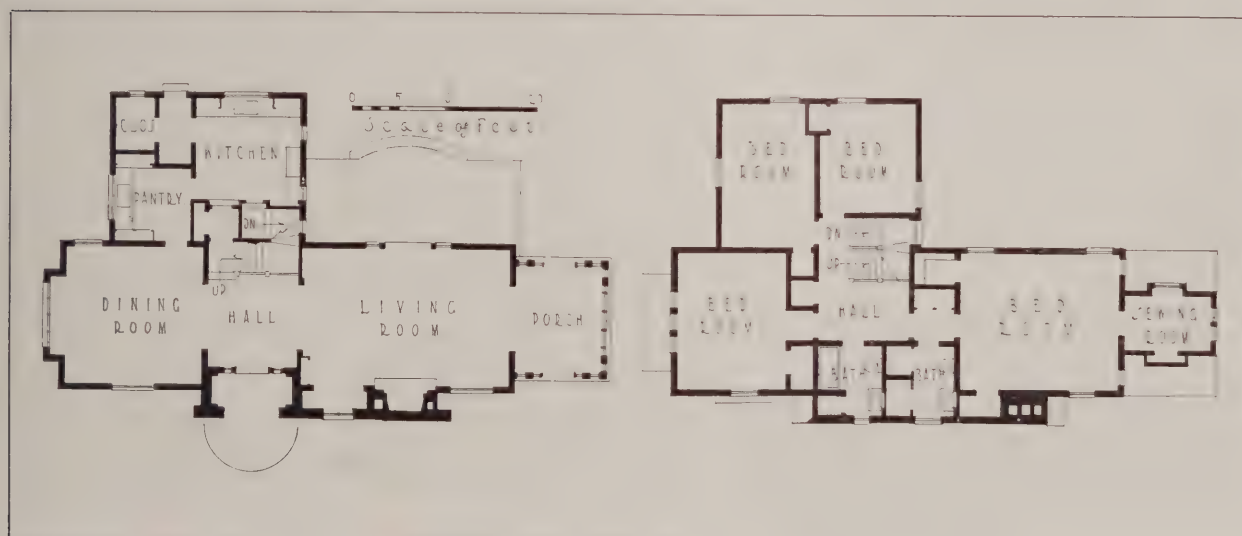
ENTRANCE, HOUSE OF DR. WILLIAM M. SHEDDEN, CHESTNUT HILL, MASS.
J. ROBERTSON WARD, ARCHITECT



HOUSE OF A. E. BETTERIDGE, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

THIS house is rather more sophisticated but no less attractive than the three simple New England houses preceding. A combination of common brick, stucco and half-timber gives this house an English quality, which is very popular with home builders today,—also it is a style particularly appropriate for wooded locations, such as are found in Westchester County and eastern New Jersey. Although the square footage of this house is not large, the height of the steep pitched roof gives additional space for servants' rooms on the third floor. There is more regularity to the plan than the picturesque

and unsymmetrical exterior would suggest. A spacious stair hall separates the living room and dining room. Back of the latter is a good sized pantry and excellent kitchen, the kitchen having windows on two sides, which is a desirable arrangement whenever possible. The materials used in constructing this house include brick and stucco on wood frames, slate for the roof, steel casements for the windows, oak for the floors and interior trim, steam for the heating, and sand-finished plaster for the interior walls. The cubic footage is 50,301, and it was built in 1926 for about \$27,926.



FIRST FLOOR

SECOND FLOOR



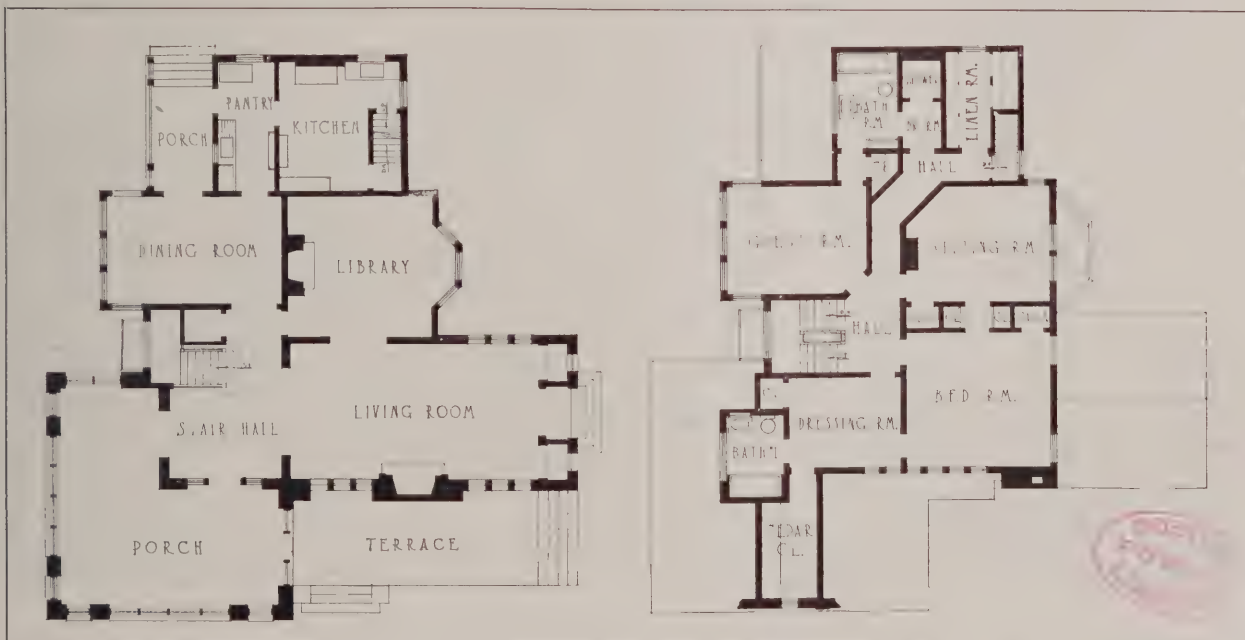
ENTRANCE FRONT, HOUSE OF A. E. BETTERIDGE, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT



HOUSE OF J. R. WILDMAN, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

THIS cheerful, picturesque house derives much of its charm from the excellent and colorful stonework combined with brick which is used for most of the first story. Stucco and half-timber and vari-colored slate give originality to the upper stories and gables. There is freedom as well as originality in both the design and plan of this house. A terrace and covered porch extend across the front, back of which are located the entrance, stair hall and living

room. The splendid height of the roof, which successfully and pleasingly dominates the entire design, makes possible the location of three servants' rooms and baths on the third floor. The construction of this house includes the use of brick, stone, stucco and wood frame for the walls, slate for the roof, steel casements for the windows, oak for the floors and interior finish, and sand plaster for the interior walls. Built in October, 1925, at a cost of \$26,000.



FIRST FLOOR

SECOND FLOOR

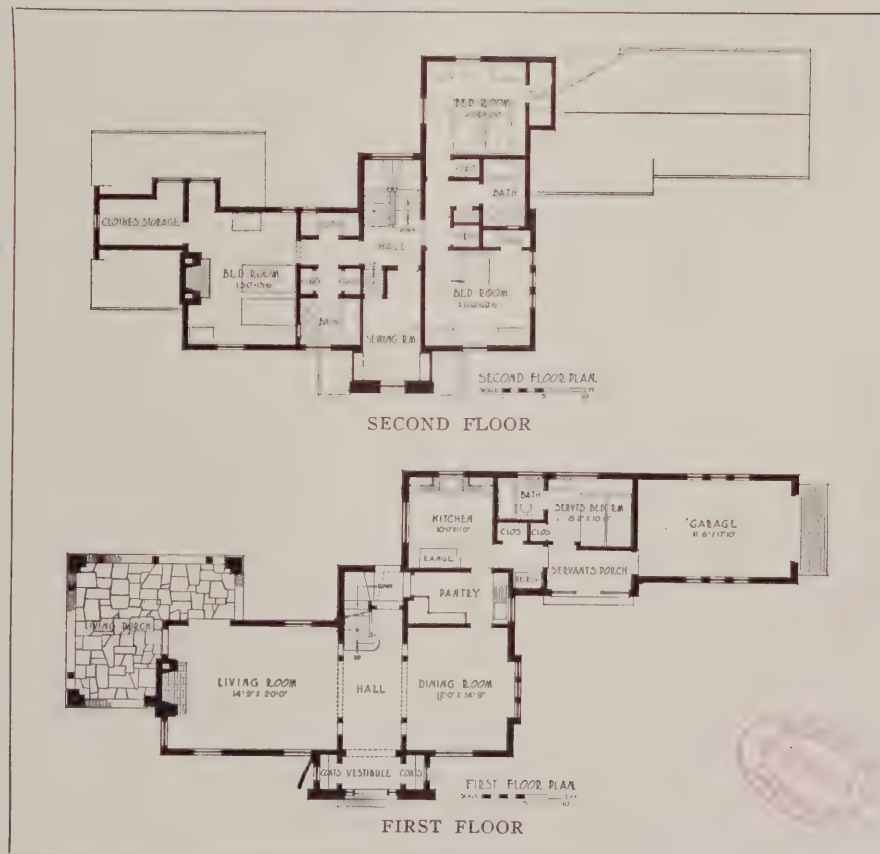


HOUSE OF J. R. WILDMAN, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT



HOUSE OF MRS. J. D. HAWKINS, MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

LOCATED on one of Montclair's beautiful hillsides, this picturesque modern version of an English cottage fits well into the landscape. The whole effect of the house is long and low, partly on account of the one-story service wing and garage on the north end of the house. Another detail which adds to the low effect of the design is the characteristically French treatment of the overhanging eaves which are broken by the high dormer windows. The height of these windows is cleverly accentuated by the use of half-timber on either side. Color is given to the design through the use of variegated stone and brick in the entrance bay, main chimney and porch piers. To further carry out this characteristic of color and texture, a heavy rough finish has been given to the





LIVING ROOM END, HOUSE OF MRS. J. D. HAWKINS, MONTCLAIR, N. J.

C. C. WENDEHACK, ARCHITECT

stucco which covers the wall surfaces. It is sometimes felt that rough and colorful masonry composed of vari-colored stone and brick is better set off when contrasted by a smoother texture stucco, but the prevailing desire of home owners today seems to be to get as much boldness and roughness of texture as possible in the stucco walls of their houses. The variegated colors of the slate roof add still another note of gaiety to this unusually cheerful house.

In passing, it is interesting to note how much personality some houses possess. Dignity, integrity, austerity and severity are some of the qualities which characterize houses. Many houses possess dignity and integrity, this being particularly noticeable in houses of the French and English Renaissance styles. Austerity and severity are constantly found in the stone houses of England and France and the United States, houses built between 1720 and 1820. Integrity in domestic architecture implies a straightforwardness of purpose and intent evidenced in both the plan and elevations. Many of the plantation houses of the South possess this quality combined with those of hospitality and cheerfulness. Some architects unconsciously put real character into their houses. Especially is this true when the joy of creative inspiration is strongest. This is just the difference which always exists between a house designed by a builder and one designed by an architect. The builder,

no matter how conscientious and thorough he may be in the construction of his house, is only building a shelter from the elements, a roof and four walls to support it. On the other hand, the architect sees in this roofed-in, four-walled piece of construction much more than a mere shelter. In his mind it becomes a home, an expression of the life which goes on within it. In his creative imagination, interest and, if possible, beauty must be given to the shell which encloses and protects so priceless and indispensable a place as a home.

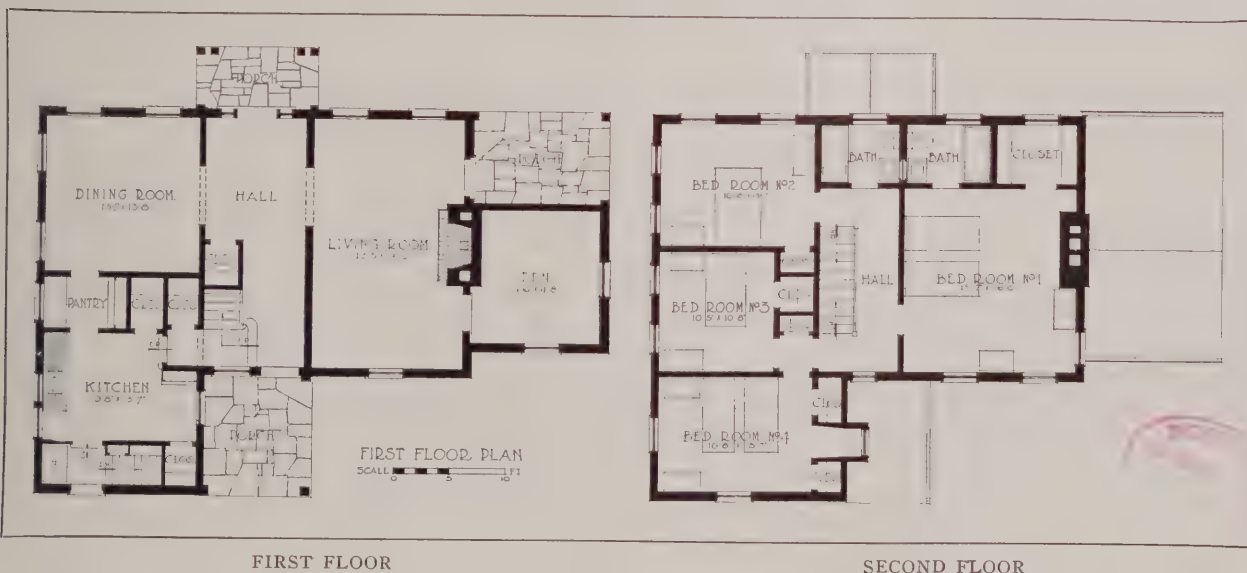
This plan is convenient and well arranged. An entrance vestibule with a coat closet on either side leads into a long center stair hall, which separates the living room on the left from the dining room on the right. Beyond the living room is a covered porch, and back of the dining room are a pantry, kitchen and one servant's bedroom and bath, beyond which is a single-car garage, accessible through the service porch. On the second floor there are three master bedrooms and two baths. As may be seen from the illustrations, the roof is not of sufficient height to permit a third story, although under the ridge pole there is a long open attic reached by a small flight of stairs off the second floor hall. Brick, stucco, half-timber and wood frame are used. Containing 41,116 cubic feet at 62 cents per cubic foot, this house cost when completed in 1925, approximately \$25,000.



HOUSE OF STANLEY M. BABSON, ESQ., ORANGE, N. J.
C. C. WENDEHACK, ARCHITECT

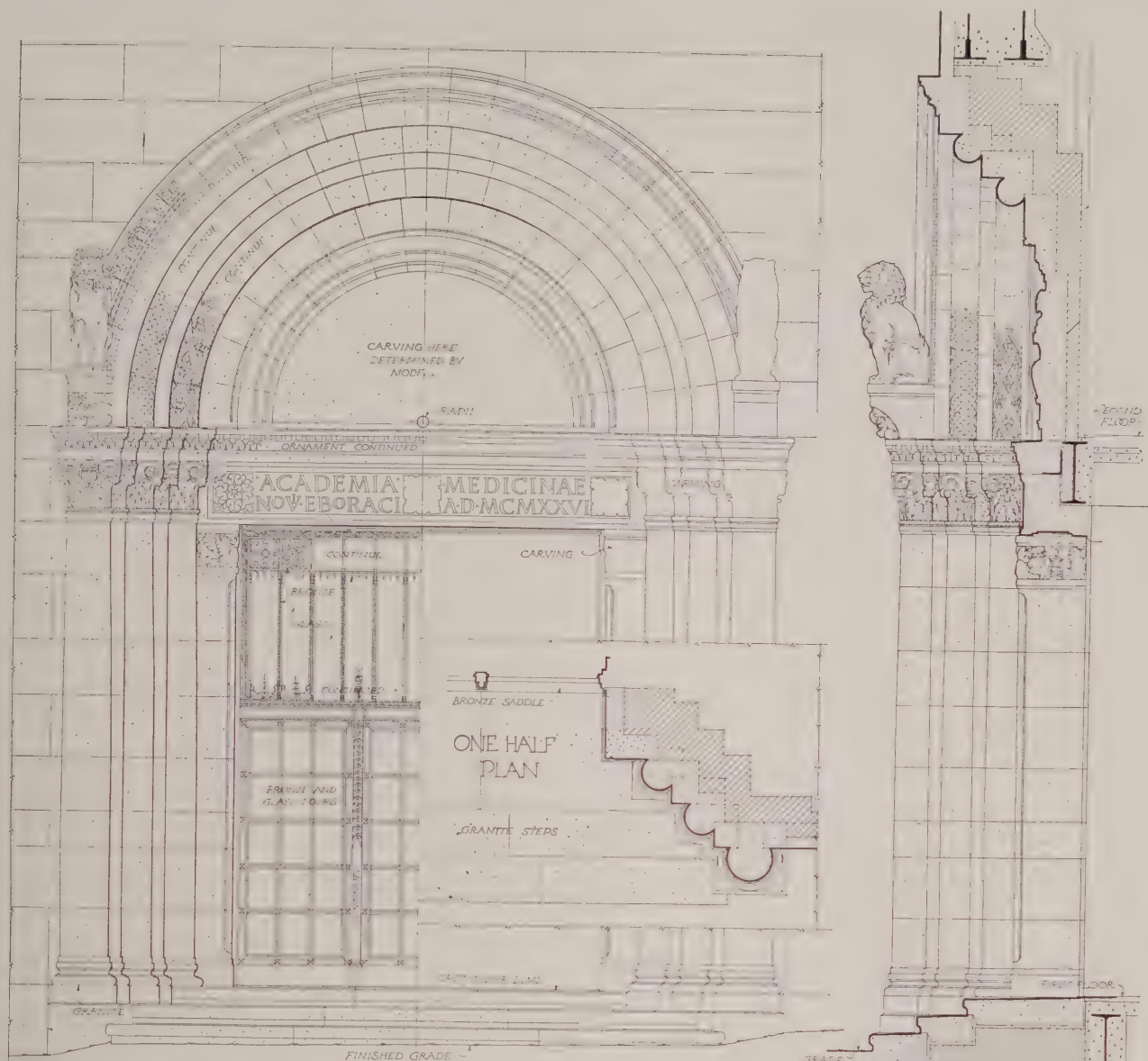
IN sharp contrast to the English types of houses shown on the preceding pages is this simple farmhouse, which with its brick ends reminds one of some of the old houses found in Connecticut. The Colonial spirit is suggested in this design by the well proportioned, small-paned windows, the gray stained shingles, and the entrance porch. The small wing containing the "den" and porch is excellently car-

ried out with brick walls and a high gable end roof, similar in pitch to that of the main house. The specifications called for wood frame, shingles and brick veneer for the walls, cedar shingles for the roof, oak for the floors, steam for the heating, and white pine for the interior trim. Completed in 1926, this house, with an approximate cubic footage of 35,290, cost 46 cents per cubic foot, or about \$17,500.





HOUSE OF STANLEY M. BABSON, ESQ., ORANGE, N. J.
C. C. WENDEHACK, ARCHITECT



ELEVATION

SECTION

• MAIN ENTRANCE DETAIL •

THE NEW YORK ACADEMY OF MEDICINE
YORK AND SAWYER ARCHITECTS NEW YORK CITY

SCALE IN FEET

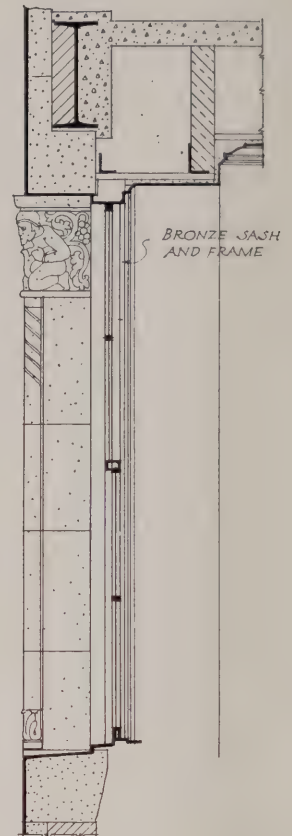
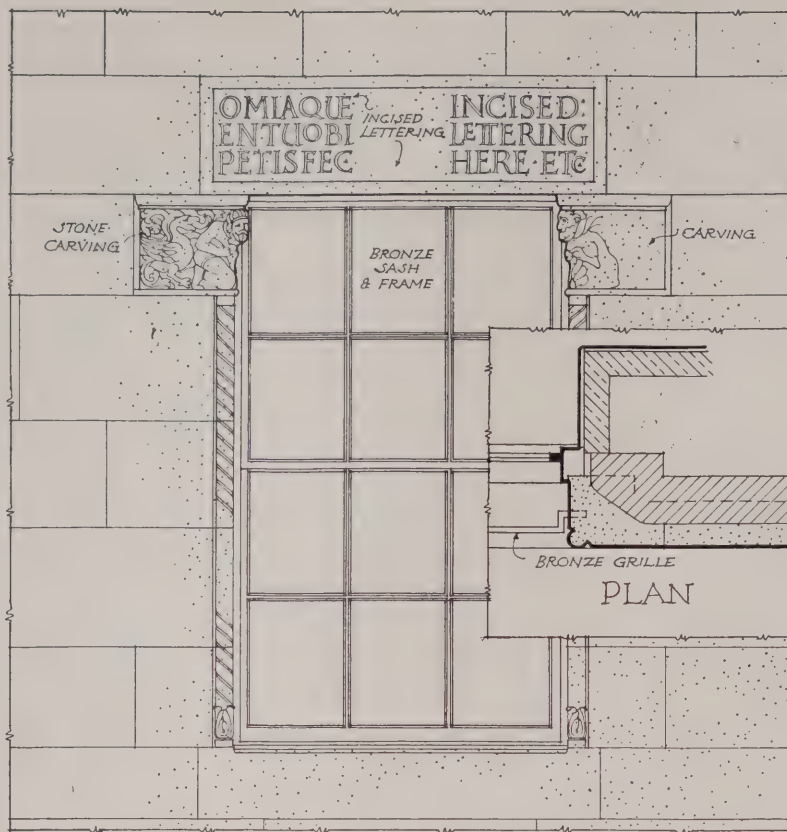


MAY
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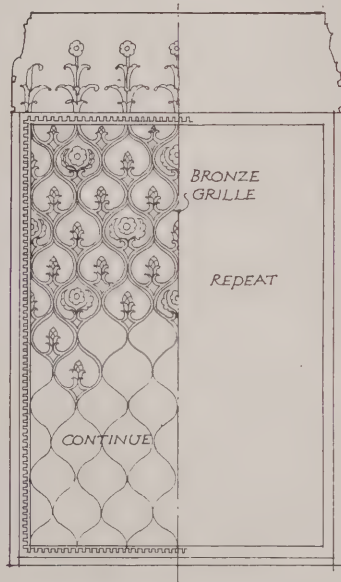
The ARCHITECTURAL FORUM DETAILS

Editor's Note. Illustrations and Plans of the New York Academy of Medicine Were
Published in the April Issue of THE ARCHITECTURAL FORUM



ELEVATION

SECTION



ELEVATION OF GRILLE
OVER WINDOW

WINDOW DETAIL ON MAIN FLOOR

THE NEW YORK ACADEMY OF MEDICINE

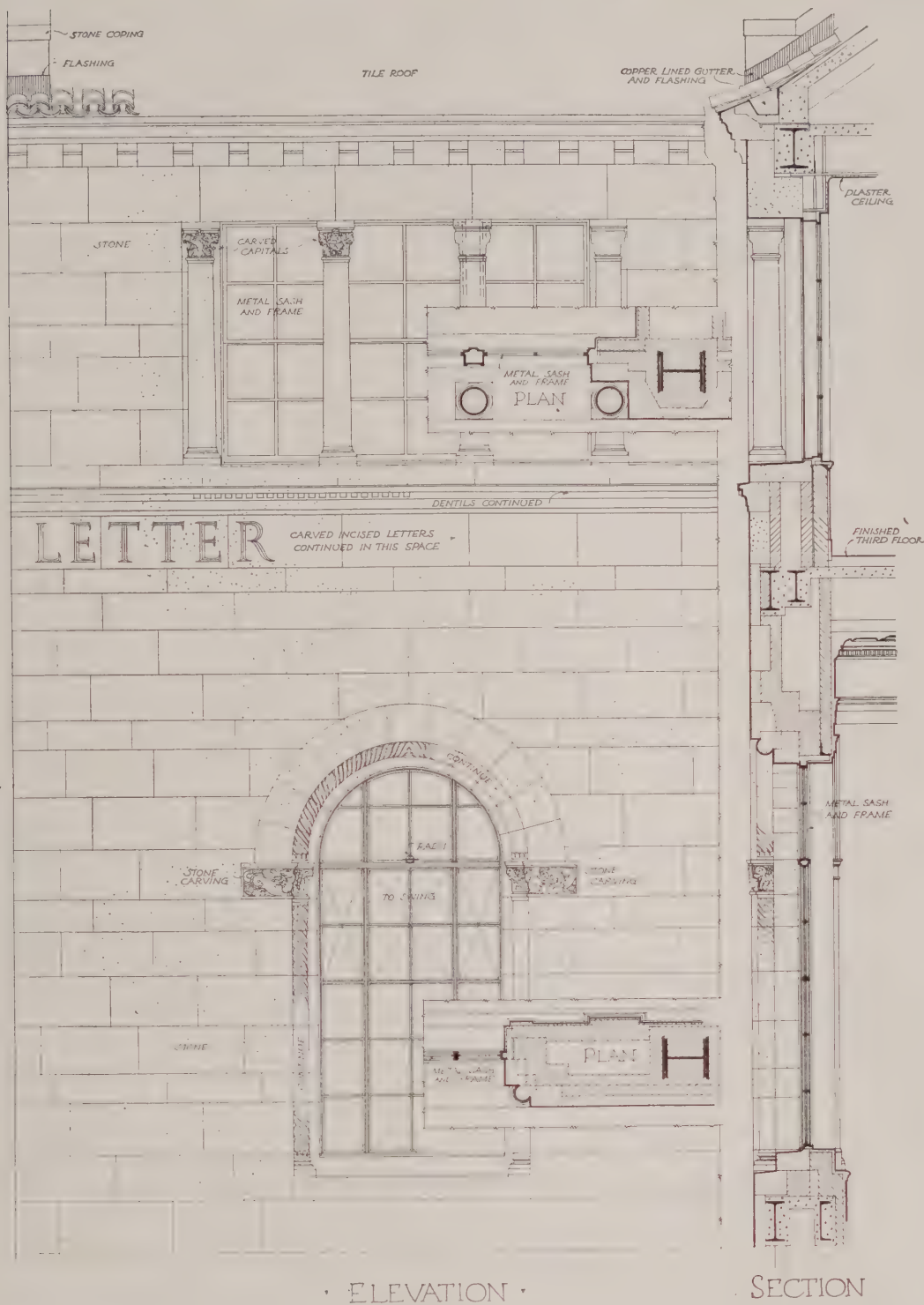
YORK & SAWYER ARCHITECTS, NEW YORK CITY

MAY
1928

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The ARCHITECTURAL FORUM DETAILS



• ELEVATION •

SECTION

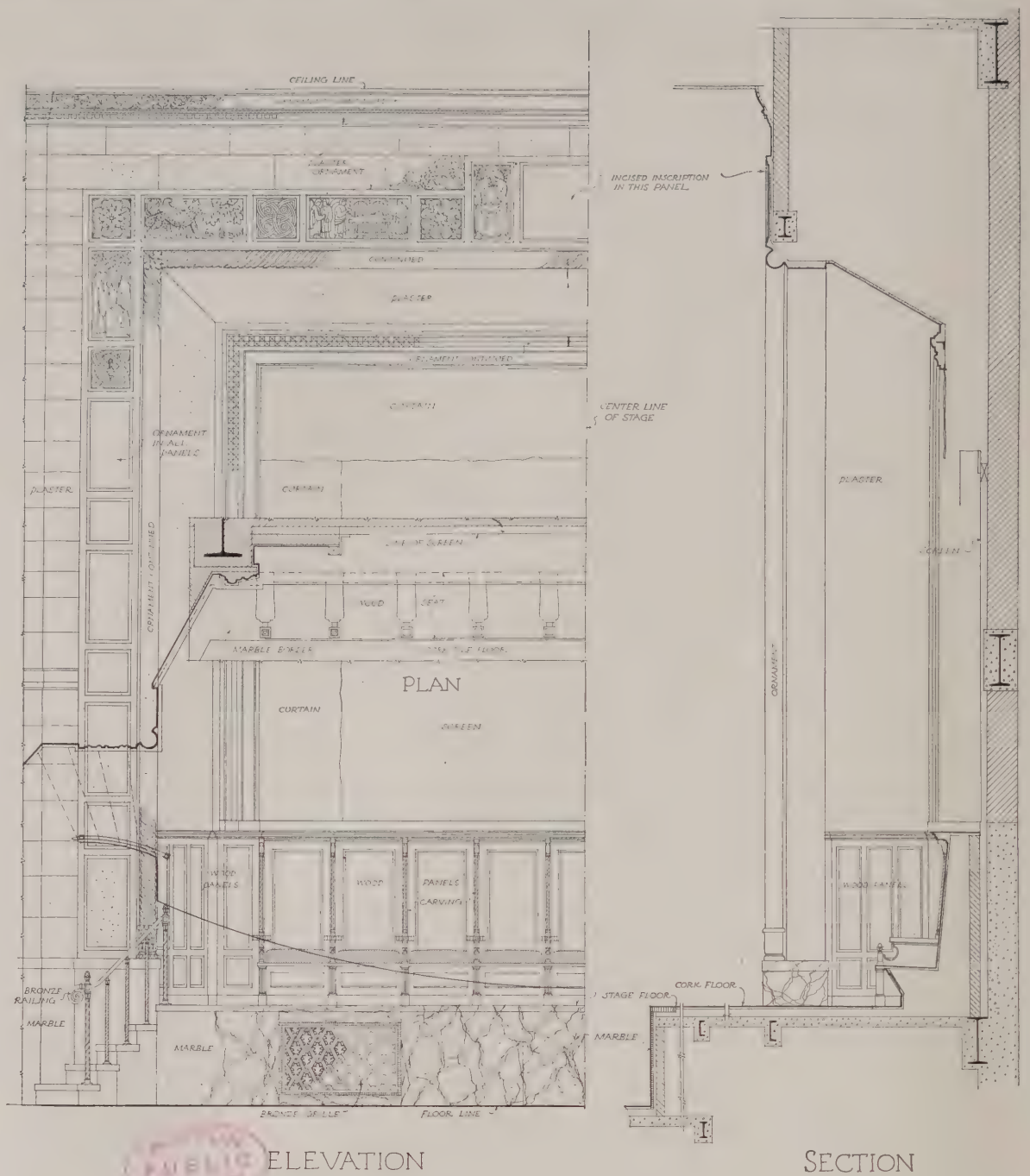
DETAIL OF AUDITORIUM WALL
THE NEW YORK ACADEMY OF MEDICINE
YORK AND SAWYER ARCHITECTS, NEW YORK CITY

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1928

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The ARCHITECTURAL FORUM DETAILS



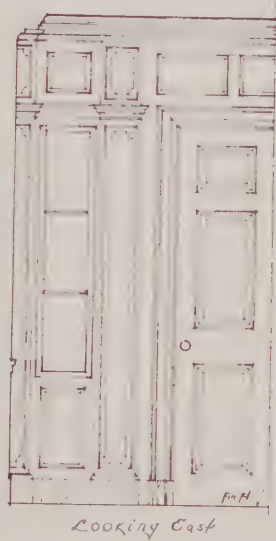
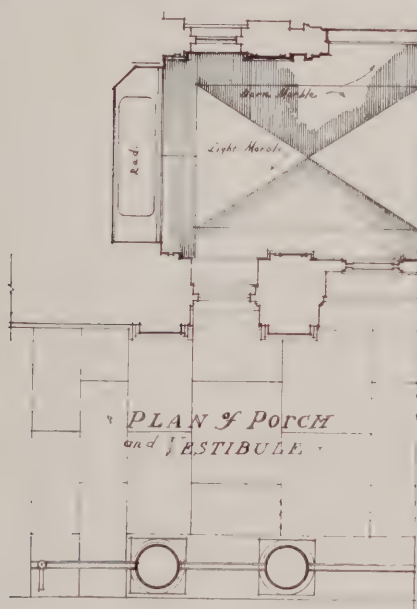
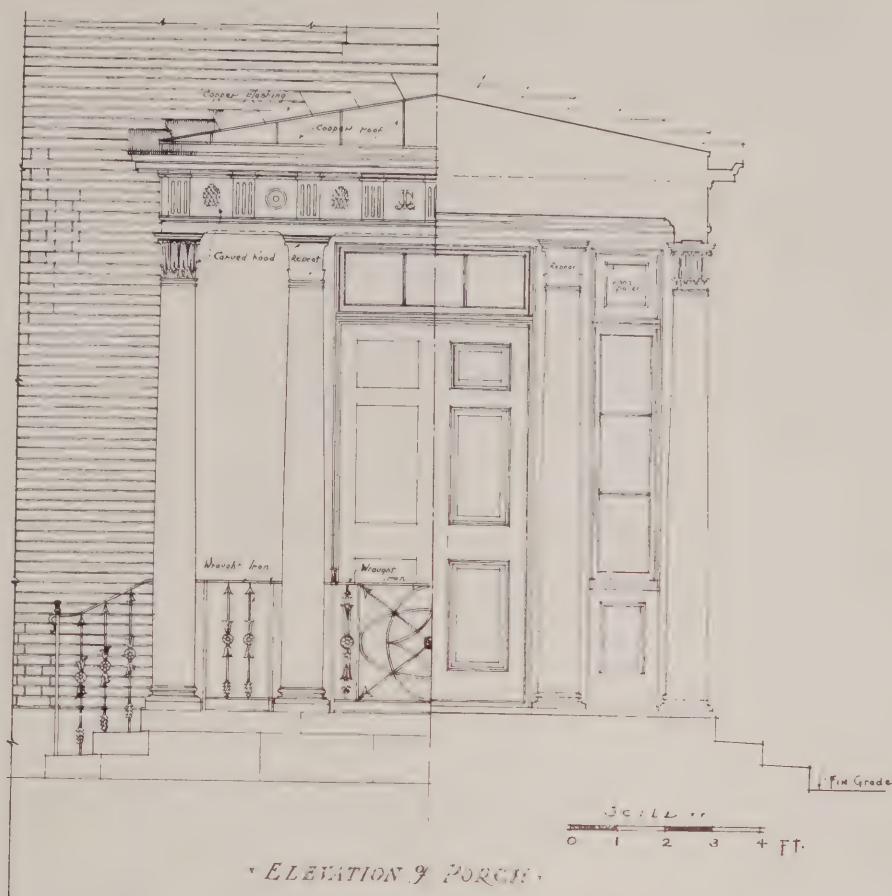
· DETAIL OF STAGE ·
THE NEW YORK ACADEMY OF MEDICINE
YORK AND SAWYER ARCHITECTS NEW YORK CITY

MAY
1928

SCALE 0 5 10 15 IN FEET

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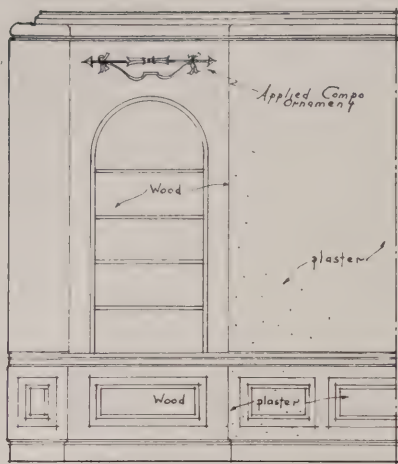
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Editor's Note. Illustrations and Plans of the House of James L. Goodwin, Esq., Were
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· Half North Elevation · · South Elevation ·



· West Elevation ·

· DETAILS OF DINING R.M. ·

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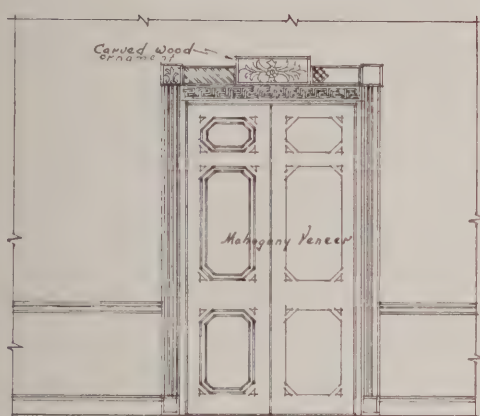
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West Elevation



Doorway



South Elevation

LIVING ROOM

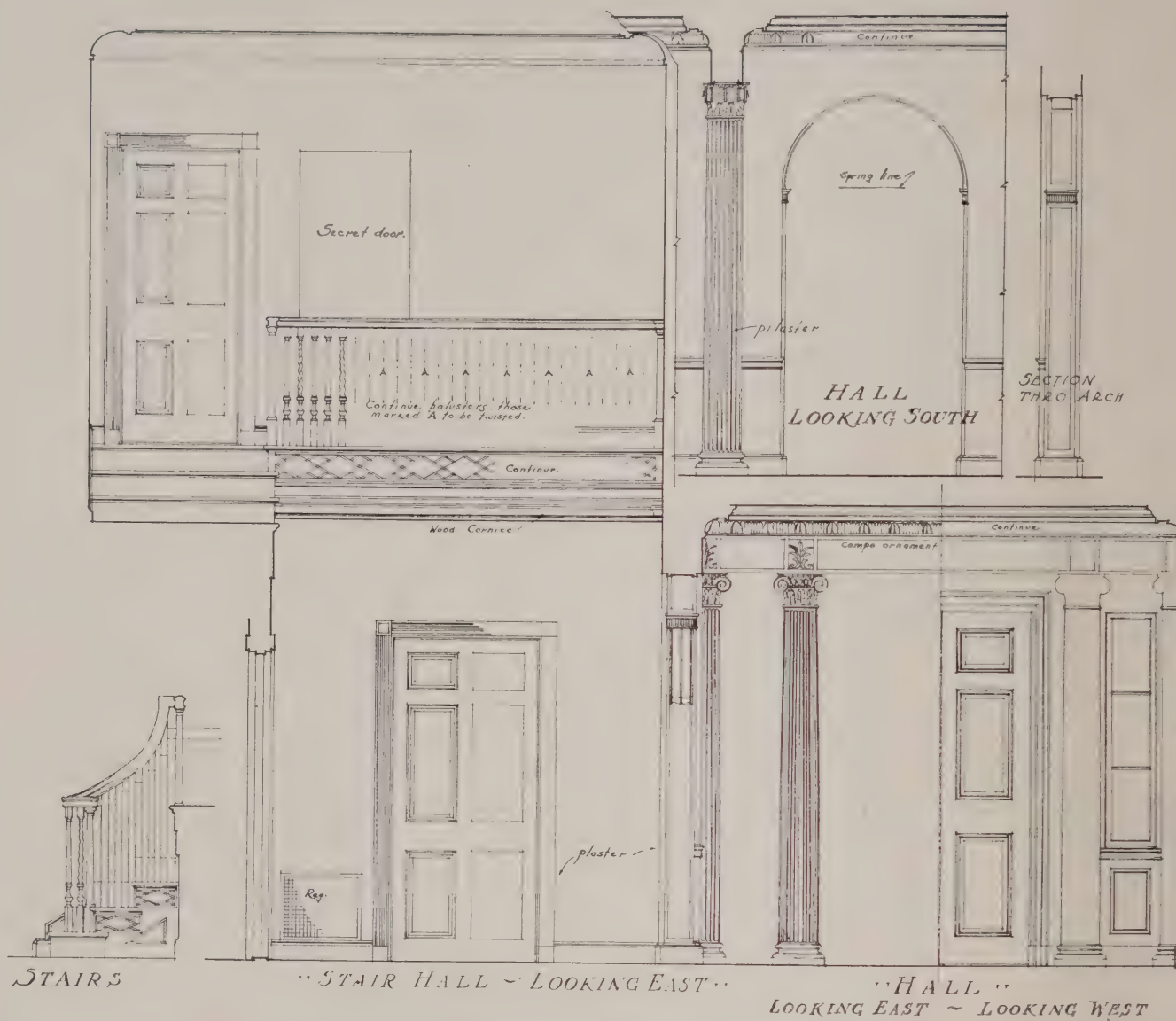


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DETAILS OF STAIR HALL

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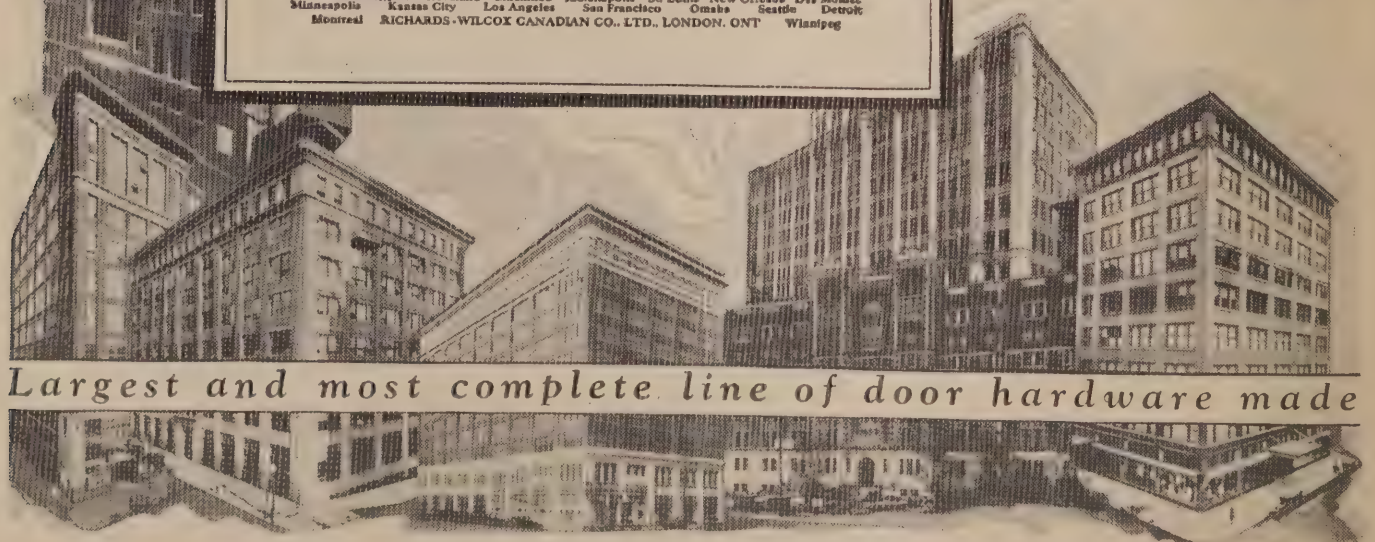
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BOOK DEPARTMENT

A VOLUME ON THE COMPOSITION AND PLACING OF CONCRETE

Reviewed by C. W. SPENCER

TO gain satisfactory results in any form of work it is of the greatest importance that the workman know thoroughly the materials with which he is to work. Thus in order for an artist to create paintings of lasting beauty it is necessary not only for him to understand how to mix his colors to obtain the necessary shades and tints, but it is also desirable for him to know something of the chemistry and the permanency of the pigments that make up his palette so that he will know which can be safely mixed and used so that the original effects will last indefinitely without fading or changing color. This is also true of the architect, who performs his work indirectly, using a large variety of building materials as his medium. The variety and complexity of these materials are rapidly increasing, but the three most important in order of their importance are steel, lumber, and concrete. The latter, which is of comparatively recent development, is rapidly gaining in importance and will undoubtedly soon surpass timber in importance as a structural building material. Portland cement, which is by far the most important binding material used in concrete, was invented in England a little over 100 years ago, but up until 1872, when David O. Saylor started his investigations with Portland cement, it was little used in America. From that time until the beginning of the twentieth century the development was very slow, and in 1894 there were only about 20 plants in the United States, producing about 800,000 barrels annually. The growth since then, however, has been phenomenal, so that at the present time there are about 140 plants producing more than 150,000,000 barrels of cement annually. This growth is due partly to new discoveries of suitable raw materials and new and improved methods of manufacture, and partly to the enormous demand for this type of building material which has arisen, its properties making it particularly suitable to the modern type of building. New equipment and elevating machinery now make it possible for the tallest structures to be constructed of reinforced concrete, producing a building of great strength, rigidity and permanence. The use of iron and steel as reinforcing for concrete also adds greatly to its possibilities as a structural material, and there is scarcely a single instance of a modern building of any considerable size which has been constructed recently without the use in at least some portion of this material. Another reason for the wide use of concrete is the necessity of building fireproof structures, and there is no material more useful in this connection, especially in floor construction. In addition to all this, the possibilities of concrete construction have been enhanced by its new use as a decorative medium.

In using concrete it is of the utmost importance that great care be taken in proportioning the mixture, mixing it, and placing it under proper conditions so that it is adequate for the purpose for which it is to be used. A slight error in any of these processes is capable of causing enormous damage, there being instances where entire buildings have collapsed due to carelessness in one of these details. While these problems are primarily the

concern of the contractor, it is highly desirable that the architect be thoroughly familiar with them in order to render efficient service in designing a structure and supervising its construction. There is a large amount of material available as a result of the scientific research which has been carried on by the various cement companies as well as by public and semi-public agencies, such as technical schools and colleges. So great is the necessity of care in connection with concrete work that many of the larger construction companies maintain their own testing and research laboratories for the careful study of concrete.

Courses in the use of concrete are given in certain colleges and vocational schools throughout the country, and it is as a textbook for such a course that "Concrete Practice" by George A. Hool and Harry E. Pulver, professors of structural engineering in the extension division of the University of Wisconsin, was written. However, the subject is so presented that the volume should be a useful guide and source of information to those connected in any way with work in concrete. The book is divided into six main sections. The first deals with fundamental considerations, discussing the various parts of the mix, describing the aggregate, both fine and coarse, and placing special emphasis on the fact that strength in concrete depends largely on having the proportion of water to cement as small as possible and still have a workable mix. The properties of concrete and the effects of various substances on its strength are also discussed. The second section covers the proportioning, mixing and placing of the concrete, considerable space being devoted to description of the various methods of determining the proper mix to give the required strength according to individual requirements. Some description of forms, concrete block manufacture, and the making of cast stone is included. In the third section typical contracts, specifications, and plans are given for various kinds of structural work. Section six is of great practical value, as it shows the best practice in estimating all the different branches of concrete work, including forms and reinforcing steel. One section is devoted to outlining the procedure to be followed in the laboratory work in designing and testing concrete, and another is on field work and takes up the subject from the standpoint of the inspector, a section which should be especially interesting to the architect. Field methods in connection with several different kinds of concrete work are described.

The appendix at the end of the volume contains much valuable and useful information in tabular form, including much material from reports of the American Society for Testing Materials, and a table from "the 1924 report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete," by use of which it is possible to determine the composition of the mix which may be expected to give a required compressive strength after having been allowed to cure for 28 days.

CONCRETE PRACTICE. A Textbook for Vocational and Trade Schools. By George A. Hool and Harry E. Pulver. 369 pp., 5½ x 8 ins. Price \$3. McGraw-Hill Book Co., Inc.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

THE IMPORTANCE OF SECOND MORTGAGE FINANCING

A Review by TYLER STEWART ROGERS

WITHIN recent years the architectural press in general, THE ARCHITECTURAL FORUM in particular, has been placing increased emphasis upon the importance to architects of a practical working knowledge of building economics and finance. Even a casual examination of the statistics showing the annual construction in the United States will indicate that but a fraction of 1 per cent of all building construction is of a purely monumental character, governed entirely by æsthetic considerations and free from problems of utility and cost. Except for the homes of the wealthy and a relatively small number of institutional and public buildings for which funds have been donated or appropriated, building construction depends upon the success of efforts to finance the projects. At least a great majority of homes and business buildings are constructed with funds supplied in part by others than the owners. The financing of real estate by mortgages has become such common practice that only rarely are new projects undertaken without securing a certain proportion of the funds through mortgage sources.

In presenting his book on second mortgages and land contracts, Dr. Reep has devoted himself to an exceedingly important aspect of real estate financing. First mortgages and the practices surrounding their procurement are practically standardized in all details. They can be obtained for almost any building venture. There are plenty of sources for funds for use in these "senior" securities. The real economic and social problem in real

estate finance is the procurement of funds to bridge the gap between the amount available on a first mortgage and the amount of the owner's equity. This need for "junior" loans has never been satisfactorily filled, and yet it is of the utmost economic importance to the continued progress of the entire building industry that it should be. This book is an exceedingly clear and detailed presentation of the problem of junior financing of real estate. It is written by a man of broad experience in home financing. Dr. Reep is a lecturer on real estate at the University of Minnesota; Chairman of the Mortgage and Finance Division of the National Association of Real Estate Boards; and President of the Home Financing Corporation and Home Building and Loan Association of Minneapolis. Much of the data presented in his book has been collected through detailed researches carried on in connection with his work for the National Association of Real Estate Boards and his analysis of building and loan associations as sources for junior financing, and this work is the first complete and comprehensive study that has been published.

Junior financing has long been burdened with bad repute, due partly to its speculative nature, but very largely to the sharp practices which have commonly prevailed. There is a peculiar legal problem having an important influence on the junior financing field which Dr. Reep has analyzed in detail and for which he has sought a constructive solution. The early pages of the book are devoted to junior financing as the chief real estate finan-

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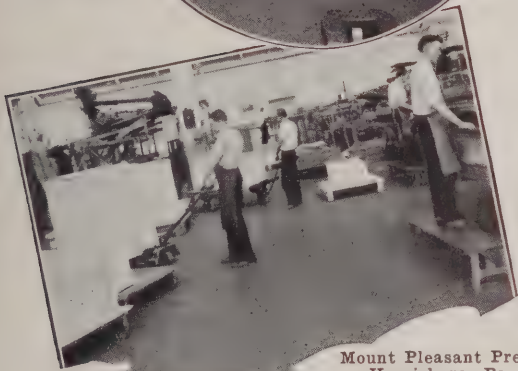
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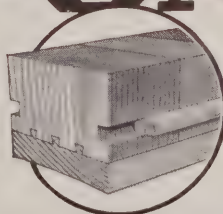
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cing problem. This is followed by a discussion of the security in back of junior liens. The security back of first mortgages is carefully analyzed, and the conclusion is reached that a 50 per cent margin is necessary for the adequate security of these senior obligations. The prevailing rate for first mortgages ranges from 5 to 7 per cent with 6 per cent as a more or less standard average, and in many states this return is the legal rate and may also be the statutory maximum. Obviously, junior liens are worth a higher return, for they have less security, but usury laws frequently make it illegal to charge any appreciable increase over the rate obtained for senior obligations. The usury laws are frequently enforced by severe penalties, ranging from forfeiture of excess interest up to forfeiture of both principal and interest and conviction for misdemeanor. Naturally, the usury laws restrain capital from entering the junior lien field, for an adequate return can be obtained only by evading the law or else by attempting to camouflage usury in an illegal manner. The risk attending the latter course is exceedingly high, for legal restrictions have been so written as to make it almost impossible to camouflage usury. Naturally, a business which must depend upon evasion or directly illegal practices has lacked interest to financial sources of integrity and responsibility, and the field of junior financing has been left almost entirely to individual lenders whose operations are without the regulation accorded by law to other types of banking.

The basic need for second mortgage financing, combined with the necessity for obtaining higher rates than are charged for senior securities and the problem of ob-

taining this higher rate without taint of usury, is a matter of direct interest to all architects, builders and bankers interested in real estate financing and development. The solution presented by Dr. Reep calls for the modification of usury laws and the proper legal control of second mortgage financing. A possible solution is also presented in the opportunities for developing second mortgage building and loan associations. In most states building and loan associations (which confine themselves entirely to making first mortgages with rare exceptions) are exempted from the operations of the usury laws. Their low cost of doing business, their intimate knowledge of the factors influencing each loan, and their co-operative nature are also factors pointing toward the possible development of such associations to solve the home building financing problem. Attention is also devoted to land contracts as compared with second mortgages. A land contract is essentially an agreement for the delivery of a deed on a specified date in consideration of payments made at stated intervals in the interim. The seller retains the deed for the property until all payments with interest have been completed. When used in its proper manner, i. e., for an actual sale based upon an extended payment system, it stands legally as a contract. When used to secure a loan it is interpreted by the courts as a mortgage and must be foreclosed rather than cancelled. Since foreclosure involves a period of redemption, whereas the simple cancellation of a contract can be accomplished in a relatively short period, land contracts have often been used in place of mortgages because of the advantages they give to the

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A field of financing so essential to national welfare and prosperity, so important in all housing and many business building problems, and so hampered by unwise or antiquated legislation and by a reputation of an unsavory nature, is worthy of the authoritative and comprehensive treatment which Samuel N. Reep has given it in his new book. The volume will doubtless have some influence toward the corrections of the evils which now retard the sound development of second mortgage finance companies. It will enjoy wide distribution among real estate brokers, operators and investors, and it will do much to clarify the problems of those now engaged on a plane of high integrity in the essential work of providing second mortgage funds. The architect will find in this book much information of value to him and to his clients in securing adequate financing for building operations on a sound and proper basis.

The author has confessed that much difficulty attended the division of the subject matter into chapters. He has, nevertheless, achieved a very logical sequence covering all of the essential points and the important ramifications of the subject by basing his discussion on the sequence of operations in making a loan. The first chapter discusses "The Chief Real Estate Financing Problem," and the two following chapters take up the "Field of Junior Lien Financing" and "Junior Lien Security." Chapter 4 is entirely devoted to "Appraising the Security," which is the first practical operation in making or purchasing a second mortgage or land contract. The following chapter discusses "Commissions and Discounts" and is based on much special research in many cities. Chapters 6 and 7 are devoted to the "Preparation of Second Mortgage Papers" and the "Preparation of Land Contract Papers." These chapters are exceedingly practical and explain clearly even to the layman the meaning of the statutory requirements and phrases used in these documents. Since usury plays such an important role in junior lien financing and since it is determined as of the time the papers are delivered. Chapters 8 and 9 deal with this subject,—the former discussing the problem fundamentally, and the latter treating of its practical aspects. Chapter 10 is devoted to the important question of "Second Mortgages by Building and Loan Associations." After the second mortgage has been closed, or after the property has been sold on land contract, the next important operation may be the enforcement of its performance or some remedy in lieu thereof. In Chapter 11 on "Foreclosure of Second Mortgages" and Chapter 12, "The Cancellation of Land Contracts," these problems are analyzed in detail.

To assist in overcoming the many obstacles now present in junior lien financing of real estate, and on the theory that light dispels darkness, the author has devoted Chapter 13 to "Sharp Practices in this Field." Here are explained many of the methods employed by unscrupulous lenders, brokers and borrowers which have brought disrepute into the lay mind to this form of banking. The closing chapters are devoted to the "Broker and Junior Lien Field" (Chapter 14); the "Second Mortgage Market" (Chapter 15); the "Organization of Second Mortgage and Land Contract Companies" (Chapter 16); and the "Future of Second Mort-

gage and Land Contract Financing" at the close of the volume. These chapters form the basis for a constructive development of junior lien financing and point the way to what will probably become an important and ethical branch of real estate banking and financing.

In general, the author is to be commended for the clarity with which he has presented his facts, for the completeness with which the influencing factors have been analyzed and set in their proper order, and for the saneness and reserve which mark this conclusion and recommendations. The book will have a wide range of interest, benefiting the student, the layman, the broker and banker alike. It is a work to be recommended to the architect who appreciates the value to himself and to his clients of a thorough knowledge of the business practices which are essential to the development of the business from which he derives his income.

The author has in no sense made this book a medium for propaganda; nevertheless his clear exposition of the legal difficulties besetting the junior lien field may become instrumental in bringing about much needed changes in usury laws. This matter deserves further notice here. At present the several states (with Massachusetts as a notable exception) have usury laws which so definitely conflict with the natural operation of the laws of supply and demand in their influence on the second mortgage and land contract market that they compel evasion or infraction, and directly result in higher charges than are necessary because of the trouble or risk involved. These laws have teeth. The losses attending an action on the grounds of usury are very bad. Infraction is attempted only by the unscrupulous lender dealing with the most ignorant borrowers, and the rates then charged are indeed exorbitant. Evasion is legally accomplished by the discount system involving a third party or straw man, whose services must be paid for as part of the borrower's expense. Either way, the borrower pays a premium because the laws designed for his protection limit the legal charges to a point substantially below a reasonable compensation for the risk involved.

The author does not seek the repeal of usury laws *per se*; rather, he feels the need for intelligent regulation of this branch of banking and real estate finance with a reasonable opportunity to place junior liens on a credit basis compatible with their worth under freely competitive conditions. Through such regulation, the cost of junior financing would be reduced, and part of the risk lessened, to the benefit of lender and borrower alike and to the advancement of real estate building. Likewise, junior lien financing would regain its lost prestige and repute, and would be restored to its rightful place among legitimate and beneficial financial practices.

Another point of special interest to those concerned with building finance is the discussion of real estate as security, and the corollary problem of real estate appraisals. The younger business generation, whose experience in real estate does not date back to pre-war periods of depression, will find the author's review of the factors which influence realty values most instructive. The importance of the work should secure it wide circulation.

SECOND MORTGAGES AND LAND CONTRACTS IN REAL ESTATE FINANCING. By Samuel N. Reep. 255 pp., 6 x 9 ins. Price \$5. Prentice-Hall, Inc., 70 Fifth Avenue, New York.



Courtesy of Lewis Copeland Company

Louis Bromberg

"GIRDERS STEEL"

From a Woodcut by Louis Bromberg

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

MAY 1928

NUMBER FIVE



COLLABORATION IN BRIDGE DESIGNING

I. THE ARCHITECT

BY

GILMORE D. CLARKE

LANDSCAPE ARCHITECT, WESTCHESTER COUNTY PARK COMMISSION

GRANTING that human happiness is greatly enhanced by beautiful and pleasing surroundings, it is highly desirable that utilitarian structures, such as bridges, should be as pleasing to the eye as it is practicable to make them, and that there should be a greater collaboration between the architect and engineer, with a realization on the part of each that science without art is apt to be unattractive, and art without science inefficient."—*Wilbur J. Watson.*

Ten years ago this spring, engineers of the American army were engaged in the construction of bridges across the streams in France to make possible the advance of the allied armies. The engineers were an important link in one of the greatest organizations of men ever assembled, and with a spirit of coördination and coöperation with other services these men made possible the advance of the armies over streams on bridges improvised at short notice. These bridge structures varied from *passerelles*, constructed of rafts kept afloat by gasoline cans, to steel structures of long multiple spans; naturally, appearance counted for naught so long as the structures sufficed for the exigencies of the occasion. We are concerned here with the design of unsightly and purely utilitarian bridges only insofar as to prevent, if possible, their construction on highways, railroads, and elsewhere. Such structures are good enough when built by armies in time of war, but they have no place in our modern civilization where beauty ought to be as much a part of life as food or shelter. But many, unfortunately the majority, of our modern highway and railroad bridges designed by engineers possess little if any more artistic merit than did those war-time structures. The creation of beauty is not primarily the business of engineers, and to obtain beauty we must call upon another profession, that of architecture. Bridges cannot be designed by engineers alone, nor by architects alone. Bridge design may be considered both an art and a science, which of course is true of almost every type of modern building construction. The fact that there have been few, if any, bridges designed by engineers within the past decade which can be said to possess beauty is a sufficient reason for considering the members of the engineering profession unfit to continue in this

important work without the aid of architects. The engineer must be brought to a realization of the fact that the art and science of bridge building constitute a joint problem for architect and engineer.

When asked to prepare an article on bridges, I immediately replied that I thought the preparation of the article should be collaborative, since the architect's contribution is but one phase of bridge design. Modern bridge design must be based upon coöperative effort on the part of architect and engineer, just as during those trying times ten years ago the war had to be conducted by the coöperative effort of infantryman, engineer, artillerist, etc. No one branch of the army service could have won the war alone; neither can the engineer alone produce a bridge structure possessing beauty of line, of mass, of texture, of detail. There is, nevertheless, a tendency today on the part of many an engineer to think that the bridge is solely his problem. We see the results all around us, expressed in hideous bridge structures on highways, railroads, and even in some of our parks. Of course there are exceptions, illustrated by such examples as some of the large river bridges about New York which are the result of collaborative design. The designing of bridges requires creative ability of the first order, from the standpoint of artistic as well as of scientific design. Collaborative effort is required, and both architect and engineer must realize that fact. A tremendous amount of effort on the part of that group of broad-gauged engineers who realize that the architect is necessarily a contributor in part to the design of the bridge, is required before artistic bridges will take the places of the ugly structures which are a disgrace to our civilization. The engineers with whom I have collaborated in the designing of many bridges believe thoroughly in collaborative bridge design. That neither architect nor engineer can alone design a satisfactory bridge structure has been proved to them. And they further believe that the architect must do more than merely attempt to "dress up" an engineering design; he must work on the problem with the engineer from the beginning. It has been shown conclusively by the engineers with whom I have collaborated that artistic bridges can be designed



Footbridge at Garth Lake, Scarsdale, N. Y.
Bronx River Parkway



Garth Woods River Bridge
Chester E. Wheeler, Designer

so as to cost very little, if any, more than the ugly.

In spite of a full knowledge of these facts, our nearby neighbors, the engineers in charge of the great program for the elimination of grade crossings in the Empire State, are unwilling to take heed, and still continue to perpetrate upon our highways structures that are a disgrace to an intelligent public. Their designs are still of the types originally developed when reinforced concrete was first used;

or, if steel, are similar to those designed 50 years or more ago. How long the public will tolerate the construction of these concrete and steel monstrosities it is hard to tell. The bridge has apparently wandered a long way from the architectural fold of which it was once so charming and honored a member, and I hope the architect may be able to call it back.

In New York state there was for a time some hope of getting artistically acceptable bridge struc-



"Bridge 33," Bronx River Parkway, Hartsdale, N. Y.
Gilmore D. Clarke, Architect

A. G. Hayden, Designing Engineer



Photos. Nyholm



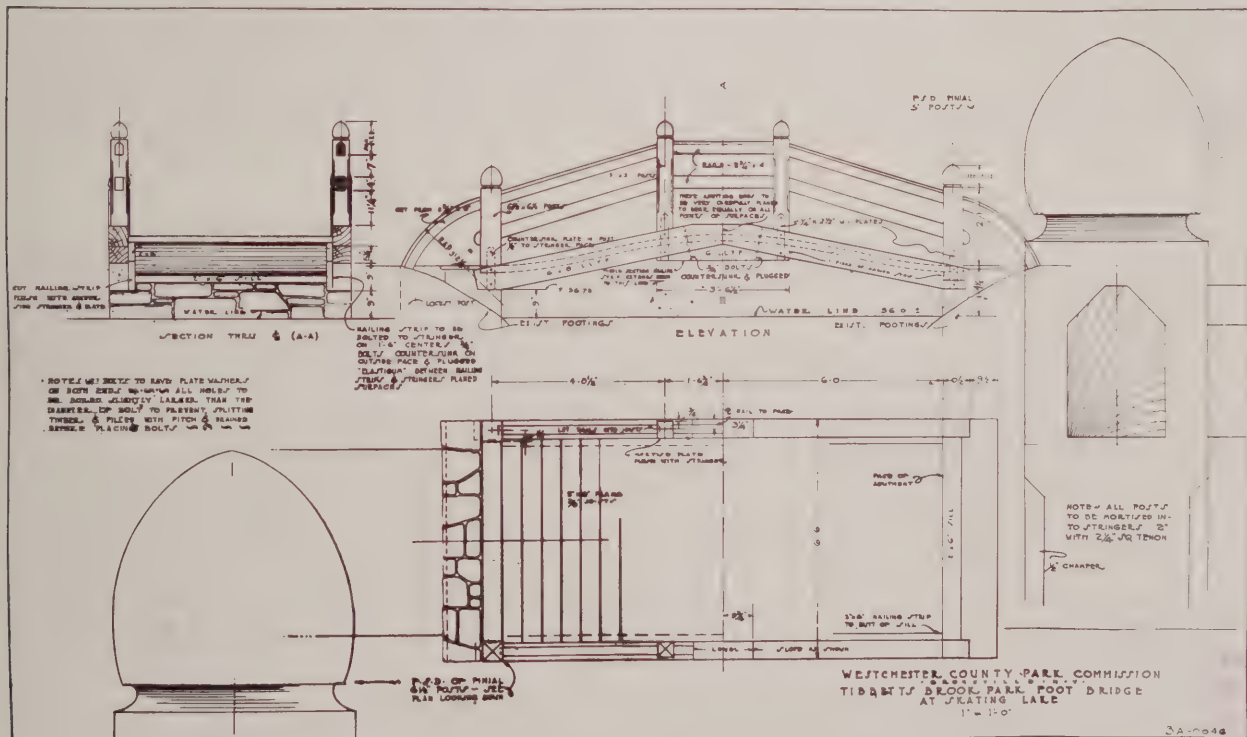
Footbridges, Tibbett's Brook Park, Yonkers, N. Y.

Gilmore D. Clarke, Landscape Architect

A. R. Jennings, Designer

tures for our highways and railroads by reason of the formation of the state Fine Arts Commission, authorized by law to pass upon all structures for which state funds were spent in whole or in part. This Commission functioned effectively for a time, but was abolished a few months ago, and the state has thereby moved backward a decade or more. At present there is no control whatever to protect the public against the engineer, unwilling to admit his

limitations, and who designs an ugly bridge which is an insult to the taste of the people who pay for it. The public needs to be informed in full concerning the facts; ugliness is not wanted; it will not be long tolerated. It is time for the architects to act, and I for one believe that the engineering profession will take the stand that the architect should be a collaborator in the designing of bridges as well as of tall buildings. The architectural profession should ac-



Working Drawing of Footbridge, Tibbett's Brook Park



Bridge Over Bronx River, South of Gun Hill Road, New York
Carrere & Hastings, Architects Guy Vroman, Designing Engineer

cept the challenge and make it a duty incumbent upon it to see that art becomes an inherent part in the design of bridge structures throughout the nation. Noble bridges live longer than any other structures built by man, as many of the old bridges of Europe bear witness,—the *Pont du Gard*, attributed to Agrippa, built in 19 B.C.; the *Ponte Sant' Angelo* in Rome, started by Hadrian; the old *Pont Neuf*, the finest over the Seine in Paris, and many others.

Accompanying this article are illustrations and sketches of several bridge structures built or to be built in parks and along parkways in the County of Westchester, New York, by the Bronx Parkway and Westchester County Park Commissions and designed by architects and engineers in close collaboration. A number of the structures are river crossings; others are at the intersections of parkways with highways, where a separation of grades is imperative for the



Palmer Avenue Crossing of Bronx River Parkway
Charles W. Stoughton, Architect A. G. Hayden, Designing Engineer



New Rochelle Road Bridge, Hutchinson River Parkway
Gilmore D. Clarke, Architect A. G. Hayden, Designing Engineer



Bridge Over Bronx River at Tuckahoe, N. Y.

Gilmore D. Clarke, Architect

A. G. Hayden, Designing Engineer

safety of modern transportation by automobile. Parkway systems are being developed, and similar types of bridge structures will be required, and let us hope that those charged with the conducting of the work spare no effort in order to clothe every structure with a charm only possible when aided by the creative ability of the artist.

Modern bridge design necessitates the use of steel and concrete. Neither one of these materials har-

monizes with a naturalistic countryside, more particularly where rock outcrops abound; therefore the bridges of the Westchester County Park System have been faced with native stone, utilizing the latest developments in engineering design for steel or reinforced concrete. In sections of the country where it is impracticable to obtain stone for facing bridges and where the concrete must be exposed, that material can of course be interestingly treated. There



Tuckahoe Road Crossing, Bronx River Parkway

Delano & Aldrich, Architects

A. G. Hayden, Designing Engineer



Bridge Over Bronx Parkway Reservation, Scarsdale, N. Y.

Charles W. Stoughton, Architect

A. G. Hayden, Designing Engineer



Masonry Details, Bridges of Hutchinson River Parkway
Gilmore D. Clarke, Architect

are many bridges of concrete which possess beauty of mass, of line, and of detail, and which harmonize with their surroundings. Where it is necessary to span railroads, a steel arch is often used in place of the stone-faced reinforced concrete arch, since the railroads are unwilling to bear the burden of the cost of a stone and reinforced concrete structure. A steel arch springing from stone-faced concrete abutments has been proved to be no more costly than the ugly, heavy steel girders on concrete abutments, which railroads are accustomed to build. The New York Central Railroad has coöperated splendidly with the Westchester County Park Commission

where parkway and railroad closely parallel each other and where single structures must be had to eliminate grade crossings of intersecting highways.

We are making rapid progress in eliminating the ugly bridge, but there is still a great deal of work to be done, and the architects' aid must be enlisted to the end that the bridges of America may possess the same charm as those of Europe. Bridges are a measure of our civilization, as they have been for centuries. Do we want our present generation measured by the ugly bridges we see dotted along our highways, or by bridges treated by artist and engineer, æsthetically good and structurally sound?



Bridge Over Bronx River Parkway, Crestwood, N. Y.
Bowdin & Webster, Architects
A. G. Hayden, Designing Engineer

COLLABORATION IN BRIDGE DESIGNING

II. THE ENGINEER

BY

LESLIE G. HOLLERAN

DEPUTY CHIEF ENGINEER, WESTCHESTER COUNTY PARK COMMISSION

WHAT has the engineer to do with bridge architecture or, for that matter, with the architecture of any structure? On the one extreme he may become the passive servant of the architect, and possibly lend himself to the perpetuation of unsuitable or uneconomical structural forms; on the other hand, he may become his own architect, with the disastrous results, from an artistic viewpoint, which Mr. Clarke has pointed out in the accompanying article. These extremes are equally undesirable. Between them, however, lies the middle ground of active coöperation between the engineer and the architect, by which the engineer is often able to lead the architect away from use of architectural designs which involve bad engineering, and by which on the other hand the architect must sometimes convince the engineer that a certain form of structure is bad architecturally or unsuited to the surroundings in which it is to be placed. It is gratifying to know that this active coöperation, which has long been customary in Europe, is gradually becoming more common in the United States. The movement in this direction will undoubtedly be accelerated by pressure from the general public, which is gradually acquiring a keen appreciation of properly designed structures that harmonize with their surroundings. This public will not much longer tolerate additions to our past mistakes in the way of ugly structures, such as continue and will continue to disfigure urban vistas and suburban landscapes everywhere throughout our

land until they are worn out or torn down through obsolescence.

This appreciation of better design is, strangely enough, being fostered to a very great extent by strictly commercial interests, such as the manufacturers of our motor vehicles, musical instruments, radios, and other everyday equipment, in which mechanical design has reached a high degree of perfection; and improvement in outward appearance has become one of the principal aids to sales promotion. The problem of adapting structural forms to satisfactory architectural requirements is often difficult and frequently requires the discarding of ideas and methods which have been considered essential since scientific design originated. While the basic theories of structural design, which are founded on natural laws, must necessarily be retained, the requirements of the engineer and those of the architect can, nevertheless, be brought into substantial conformity if there is a sufficient desire to have them do so. It will never be possible to reach common ground if the engineer assumes the attitude that the structural requirements are of paramount importance, nor if, on the other hand, the architect is unalterable in the belief that the architectural requirements are supreme. In any given problem it will almost invariably be found that the requirements of one or both can be modified without greatly compromising the requirements of either.

The architectural and structural forms illustrated

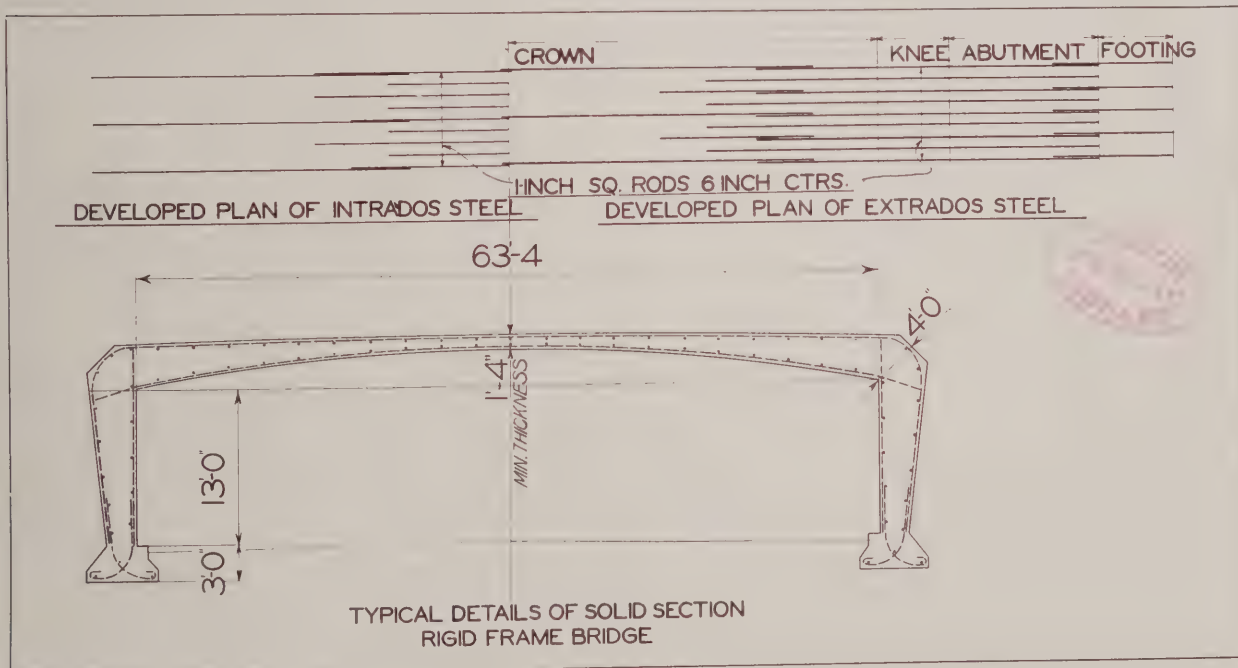
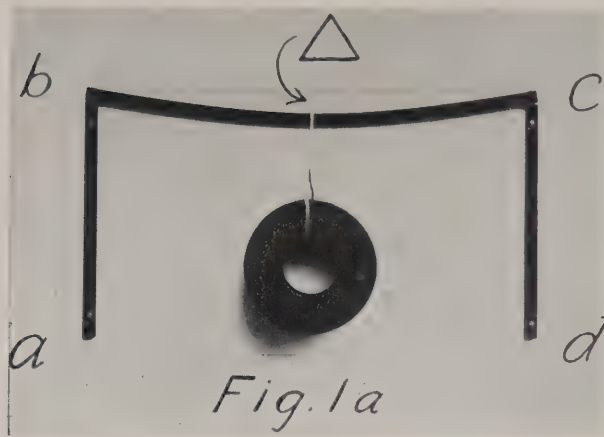
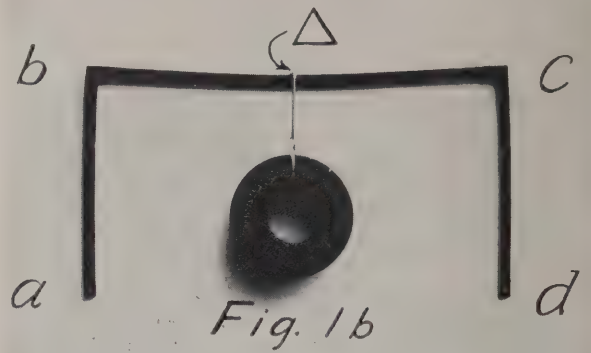


Fig. 1



Model of Girder Abutment Bridge. Girder Simply Rests on Supports



Model of Continuous Rigid Frame Bridge. Girder and Supports Form One Frame

in these pages were, it is true, adapted to the requirements of park and parkway construction, but there is nothing inherent in their design or construction which would preclude their use on highways throughout the country. Fig. 1 shows the design of a rigid frame reinforced concrete structure which was adapted for use in bridge construction by the Westchester County Park Commission's designing engineer, A. G. Hayden. Mr. Hayden describes this design in these words:

"The principle of continuity (rigid frame construction) was deliberately applied in the invention of a new structural form calculated to best meet conditions imposed by restricted headroom at highway crossings and possessing the utmost flexibility for architectural treatment. New methods of design were developed, which permitted great improvement over the few existing examples of simple frame construction. Moreover the new type of structure showed substantial economy over many other types.

Fig. 1 illustrates a statically indeterminate structure, that is, one in which analysis of the stresses is impossible by the principles of statics alone. The determination of the stresses is possible, however, by higher forms of analysis. It is beyond the scope of this article and the ability of the writer to enter into a thorough discussion of stress analysis for indeterminate structures. Those who desire to go more fully into the matter of design are referred to articles by A. G. Hayden, *Engineering News-Record*, January 11, 1923, p. 73; *Engineering News-Record*, April 29, 1926, p. 686; by Professor George E. Beggs of Princeton University in the "Proceedings of the American Concrete Institute, 1923." Figs. 1-a and 1-b will indicate clearly the difference between the statically indeterminate rigid frame and another common type of construction. In Fig. 1-a is shown a model of a girder-abutment bridge of three parts, a girder simply resting on two supports. A load is applied and a certain deflection, Δ , is observed. It should be noted that in this form of structure the supports play a purely passive part and are subject to compressive stress only. In Fig. 1-b the same parts are used, but the girder is rigidly connected to the supports. We now have a structure which is continuous from the foundation on one side around to the foundation on the other side. The same load is applied, and it is found that the deflection, Δ , is now less than half what it was before. The flexure in the supporting members indicates that they are now doing part of the work. The conclusion to be drawn from these models is that less material is required in the continuous rigid frame structure than in the discontinuous girder-abutment design, to carry the same loads.

Comparative estimates of the costs of different types of construction for the same location indicate that the rigid frame type has an advantage in the matter of cost of from 8 per cent to 10 per cent over other types of construction. The question naturally arises as to why, if there are advantages in the way of economy and adaptability, this form of construction has not been seized upon for general use. One

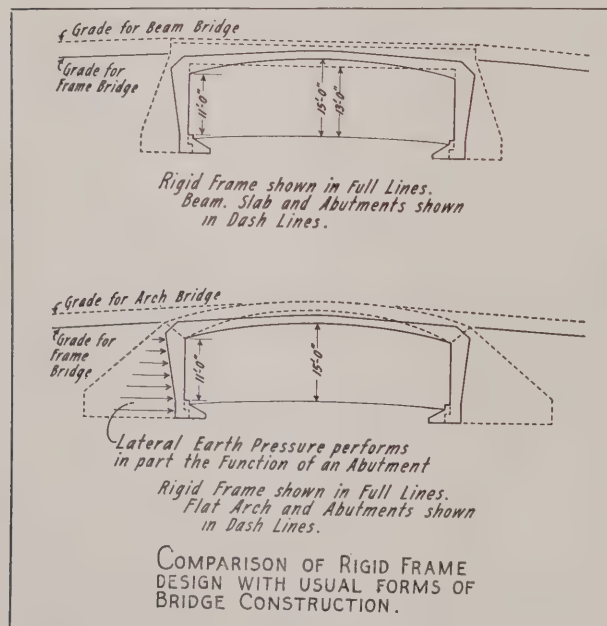


Fig. 2



Fig. 3. Reinforced Concrete Bridge, Bronx River Parkway, near White Plains, N. Y.
Palmer & Hornbostel, Architects
Guy Vroman, Designing Engineer

reason is that inertia must always be overcome before an innovation of any sort is generally adopted, and the second is that while most engineers in general practice are able to handle beam-abutment designs, reinforced concrete girder-slab-abutment designs, or even reinforced concrete arch designs, they are alarmed at the apparent complexity of the mathematics which must be employed in the designing of many statically indeterminate structures. It has been found in the work of the Bronx Parkway Commission and the Westchester County Park Commis-

sion, however, that as the designing of structures proceeds, new and shorter methods are continually being developed. These are being published in the technical journals, and as they become more and more widely known, they will, no doubt, be more generally adopted for use in highway bridge construction and for grade crossing elimination work.

In Fig. 2 the advantages of the rigid frame design in the way of economy of material, increase in headroom due to decrease in depth of material, and resulting decrease in grades for the same length of

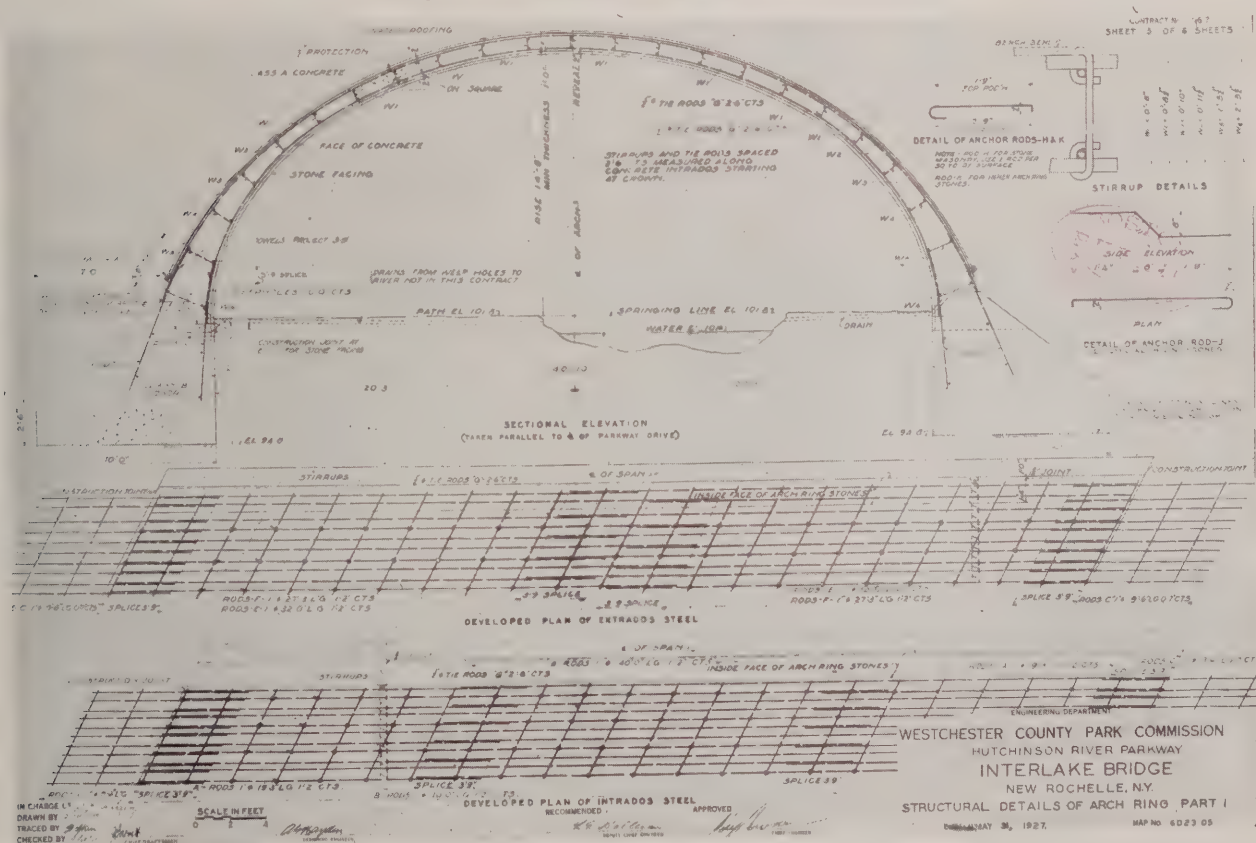


Fig. 4. Economical Type of Reinforced Concrete Arch



Fig. 5

Architectural Design for Odell Avenue Bridge, Saw Mill River Parkway
Stone Faced Rigid Frame Span at Left. Steel Rigid Frame at Right

Gilmore D. Clarke, Architect

A. G. Hayden, Designing Engineer

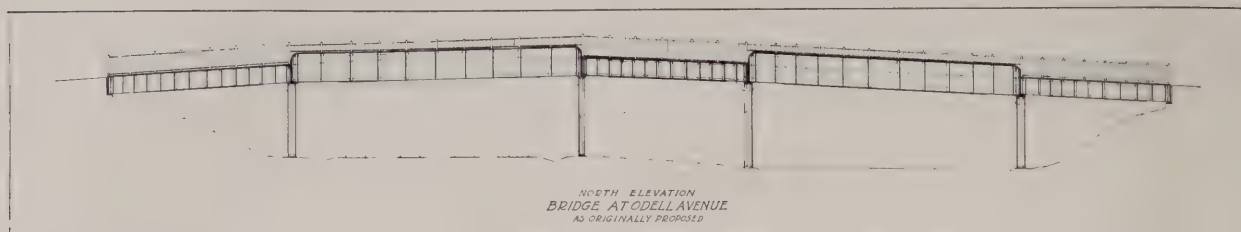


Fig. 6

Steel Girder Design Originally Proposed for Odell Avenue Bridge

approach, are strikingly shown. This rigid frame design was used as the structural parts of several of the bridges shown in this and the accompanying article by Mr. Clarke, and in a number of other bridges not illustrated. Nor should the reinforced concrete structure without stone facing be entirely discarded. There are locations where a properly designed concrete bridge will be found not inharmonious. Fig. 3 shows such a bridge, which was erected in the Bronx River Parkway over the Bronx River and tracks of the New York Central Railroad near White Plains, N. Y. Fig. 4 shows a very economical reinforced concrete design which lends itself to certain forms of arch construction. Steel may also be adapted to

certain locations and conditions, as is evidenced by the bridge shown in Fig. 5, which was designed to take the place of a broken-backed girder bridge originally proposed and shown in outline in Fig. 6.

The cooperative spirit under which the Bronx Parkway Commission and Westchester County Park Commission bridges have been designed, and the new structural forms which have been developed by Commission engineers for adaptation to the architectural requirements, have caused widespread discussion, particularly among engineers. Representatives from several state highway departments and railroad companies have visited the Commission's offices to study the methods used so successfully.



Reinforced Concrete Bridge of Unique Design, Bronx River Parkway

Delano & Aldrich, Architects

A. G. Hayden, Designing Engineer

PLUMBING FOR THE TOWER TYPE OF BUILDING

BY
HAROLD L. ALT

MODERN development in building construction tends toward the planning and erecting of higher structures. Congestion of population, rising real estate values, and the desire for light all combine to make increased heights desirable, and since the plans of a building over 100 stories high were approved by the New York Bureau of Buildings, no doubt of the possibility of making structures of lesser heights entirely stable should exist.

Granting that, with modern steel construction scientifically designed, buildings of from 40 to 80 stories are entirely feasible, the next problem has to do with the proper servicing of such an enormous amount of floor area so high above the street. Elevators to properly serve the upper floors require so much additional space as to seem almost prohibitive; heating lines grow to abnormal sizes, with the expansion increased in proportion to the height; the chimney occupies a gross floor area, owing to the large number of stories through which it must pass, as to seem unreasonable. But the greatest difficulty seems to concern the plumbing. It must be remembered that the plumbing system handles water, and as water is a commodity of considerable weight, difficulties arise in the plumbing which require special treatment. Roof drains, soil stacks and hot and cold water lines are some of the items which cannot be handled in the same manner as in lower structures. Pipes multiply and require space allotment which would be considered out of proportion in lower buildings.

Plumbing Work. It is the purpose of this article to point out some of the difficulties encountered with plumbing in the high or "tower" type of building, and to make constructive suggestions in connection with various schemes that have already been worked out for the purpose of overcoming these difficulties. For the purpose of this article the "plumbing," as far as covered, will be considered as consisting of soil, waste and vent stacks, hot and cold water pipes, and roof leaders. Special services, such as compressed air, gas, vacuum cleaning, drinking water, refrigeration, fire lines and so on, cannot be covered in an article of limited length, so these must be left for future consideration. In general, a building in which proper provision has been made for the incorporating of the major services, can have the special services included with only unimportant changes.

The Soil System. In providing for water closets in high buildings great care must be taken in arranging the soil piping; this is due, primarily, to the unusual height and to the excessive number of fixtures on a stack. In cities where combined soil and waste stacks are permitted, the load on the stack is increased by whatever number of waste branches drain from each floor. In order to assure the most

dependable type of service, soil stacks are run so as to take care of alternate floors. Thus one stack would take the drainage from all the odd numbered floors in the manner illustrated in Fig. 1. In the event of one of these stacks becoming clogged up or having a stoppage occur in the horizontal basement section, only the toilets on alternate floors would be put out of commission, so that occupants by going either up or down one flight of stairs would find facilities in spite of the one stack's being unusable. At the base each stack would be run into a separate house sewer, which would be carried to and connected with different sewers in streets on either side of the building, so that even the temporary blocking of the street sewer or connection between the building and the street would still leave toilets on alternate stories in service.

Soil stacks for the lower portion of the building should be taken care of separately from those serving the higher portions, and the arrangement should be made so that stacks serving the upper portions have no connections of any nature with those in the lower stories, this again operating toward a reduction in stack size and also giving an opportunity for the building of an enormous head behind any stoppage which may occur near the bottom of the stack or in the horizontal run to the street. Setbacks, which usually accompany the tower type of construction, materially aid this arrangement by permitting soil stacks serving the lower portions of the building to be brought out of the lower setback roof and there terminated. Stacks serving the next higher section run through the lower section without openings and serve the portion of the building between the first setback and the next higher; this scheme is followed out until the stacks going to the top of the tower portion are encountered, which stacks serve alternate floors in the tower with no outlets below. This is diagrammatically shown in Fig. 2. It has been found that in tall structures it is not desirable to run soil stacks in a perfectly straight, vertical line, because the water flowing down the stack attains too high a velocity, giving rise to noise. For this reason soil stacks are deliberately offset at points about 10 stories or 15 stories apart, and the flow is thus retarded. Provision for such offsets or changes in direction should be made in the original building design, since otherwise considerable difficulty may be experienced in trying to incorporate them later.

Waste Stacks. Waste stacks must be provided where lavatories are to be installed in offices, and these in most cases will follow the structural columns. Considerable floor space may be saved if the installation of these waste stacks is anticipated in laying out the steel frame. It may sound unreasonable to suggest the arrangement of steel framing

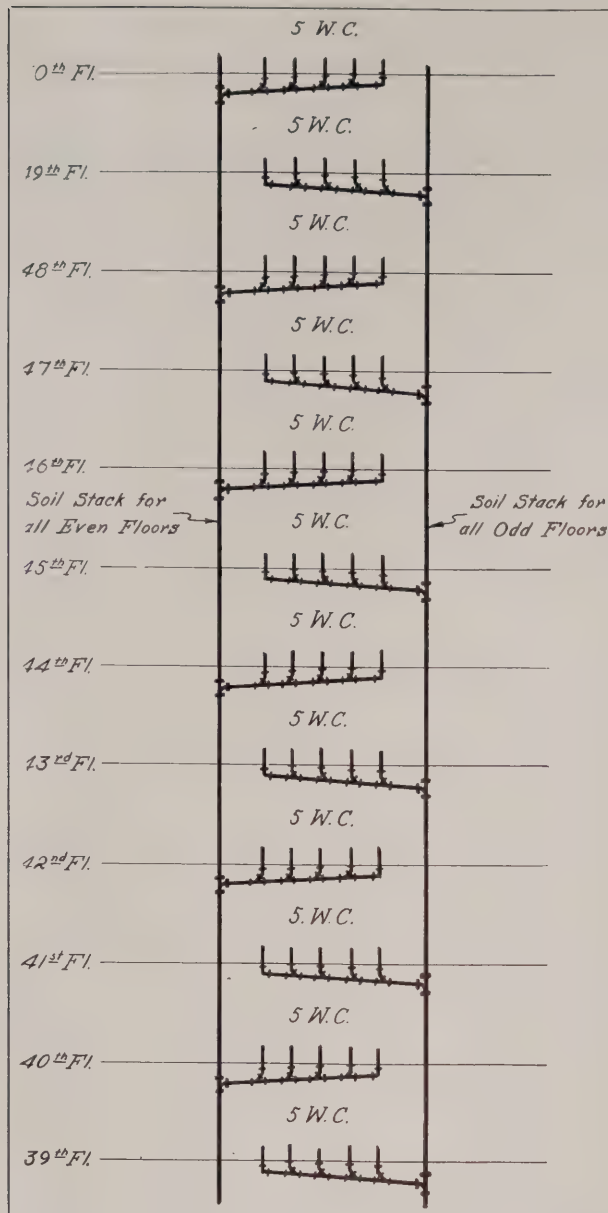


Fig. 1

to suit the plumber's waste pipes, but such has already been done and the space saving is considerable. It is not necessary to make any changes in the structural steel beyond working out a special column connection for beams, so that a small opening is provided on each side of the column in the manner illustrated in Fig. 3. This is commonly termed a "bracket" connection as distinguished from the ordinary "angle" connection shown in Fig. 4. This scheme lends itself very readily to the putting of the waste stack and cold water riser on one side of the column and the vent stack and hot water riser on the other side, as illustrated in Fig. 5. If the ordinary steel framing should be used, about the best that could be done would be as indicated in Fig. 6. The remarks just made about soil stacks apply in less forceful form to the waste stacks; they should not be made over 3 inches in size if possible, and they

should serve only certain horizontal sections of the building; they should be offset or shifted from time to time to break the water fall.

Vent Stacks. Venting and vent stacks should receive careful attention. Plumbing codes vary so greatly in their venting regulations that it is hard to give any recommendations except to say that in high buildings vent stacks should be installed whether the local code requires their use or not. Where larger sizes are not demanded by ordinance, the vent stack may be safely made somewhat smaller,—a 6-inch soil stack with a 4-inch vent stack or a 4-inch soil stack with a 3-inch vent stack. For waste stacks the same applies, only running to smaller sizes, such as a 4-inch waste stack and 3-inch vent stack, a 3-inch waste stack and a 2½-inch vent stack, or a 2½-inch waste stack and a 2-inch vent stack. There is nothing to be gained in offsetting vent stacks, as there is no water flowing through them. Vent stacks should be parallel the respective soil or waste stacks which they serve, and as soon as the bottom connection on each particular stack is reached, the vent stack should be run back into the stack through a 45° ell and a Y fitting. There is no object in venting soil or waste below the bottom fixture connection, since any air caught below this point cannot blow out in fixtures below (owing to there being no lower connections to the stack), and any retarding effect on the falling water in the stack is really of beneficial character.

Materials of Construction. In all high building work, galvanized steel or galvanized wrought iron pipe can be used for waste, soil and vent stacks, this being made up with galvanized, cast iron, screwed recessed, drainage fittings, with all pipe most carefully reamed out. Where lines run underground, extra-heavy, uncoated, cast iron soil pipe and fittings with calked lead and oakum joints should be used. Expansion joints are sometimes used in the vertical risers every 20 stories or less, but difficulty will probably be experienced with the local authorities if any type of slip joint is advocated. A corrugated copper joint with flanged ends and companion flanges can generally be used. There is also a cast iron slip joint which has been approved in some of the large cities.

Water System. Furnishing water supply for the building will have an important bearing on the building design, and this is one point on which it is well to be forewarned. It is most essential to keep the water pressures down to a point where excessive splashing and undue wear and tear on the equipment will be avoided. For this reason the building should be divided into horizontal sections or zones of 10 to 15 stories each, and each of the separate zones should have its own individual house tank and hot water heater. The house tanks and hot water heaters for the same zone will not come in the same tank room. In order to obtain satisfactory water pressure on the highest floor of each zone, the tank room for that particular zone should be located in the zone above

and two stories higher. This will result in a pressure head on the fixtures in the top story of the zone equal to that of two stories plus the height of the water line in the tank (which usually is about 25 or 30 feet). The hot water heater for the same zone must be located at the bottom of the zone in order to circulate the zone by gravity.

Hot Water Systems. For convenience the hot water heater is usually placed in the tank room of the zone below, and the hot water is fed down one story without circulation, but it circulates to the stories in the portion of the zone above the hot water heater level as usual. This will probably be made a little more clear by referring to Fig. 7, where a typical zone is illustrated with the levels on which the house tank and hot water heater for that zone would be installed. Of course the hot water heaters may be dropped down to the story below the lowest in the zone, which will give hot water circulation to all stories included in the zone without dead ending. This will entail extra heater rooms at certain levels which will not be the same levels as those on which the house tanks are set, so that this arrangement, which is shown in Fig. 8, is usually not as economical in floor space as the scheme shown in Fig. 7.

Materials for Water Systems. It is the growing practice to use brass pipe and fittings for both hot and cold water lines in the best class of construction work, and especially when lines cannot be replaced readily. Steel and genuine wrought iron pipe, galvanized, are often installed in the larger sizes, owing to the greater thickness of shell and the rapidly increasing cost of brass as the diameter enlarges. All joints should be screw joints on the smaller sizes and flanged joints on the sizes of 6 inches or over. They should be made up with only red or white lead used as a lubricant on the male thread only, and they should be tested to a pressure 50 per cent in excess of the maximum working pressure. House tanks are invariably steel, usually square or rectangular, and braced with substantial angles; they are built with angle iron curbs, and have $\frac{1}{8}$ -inch steel covers, made up in sections and suitably stiffened. The house tank construction is similar to that in the building of ordinary height. The same may also be said concerning the hot water heaters; owing to the zoning of the building, the pressure on the heaters is no more than that ordinarily encountered in lower buildings, and the same heaters of proper capacity will give satisfaction in structures of the tower design.

Hung Ceilings and Pipe Spaces. It is highly desirable to zone the building for water supply purposes at the earliest possible moment, so as to provide hung ceilings with pipe spaces above for horizontal distribution mains. When such spaces are provided it not only means increased floor heights for those particular stories but also provides the heating system with horizontal distribution space for supply mains and drip lines. With a proper amount of forethought, ceiling spaces and tank rooms may

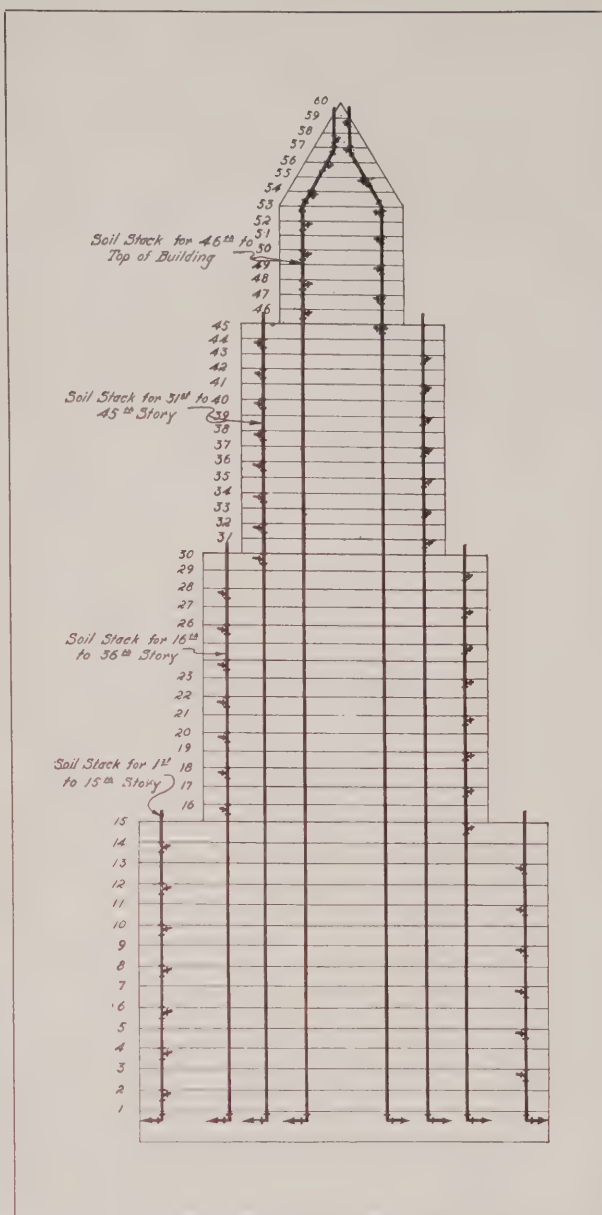


Fig. 2

be arranged so as to dovetail with the hot water and heating arrangement. Through lack of appreciation of certain possibilities in the original designs, most builders fail to take the full advantage possible from the hung ceiling owing to the fact that it is usually attempted to fit in the equipment installation with previously located hung ceilings instead of the hung ceilings being arranged to suit the requirements of the installation.

In Fig. 9 is illustrated an arrangement of hung ceilings so located as to accommodate:

- (a) Cold water supply horizontal distribution for each zone.
- (b) Hot water supply horizontal distribution for each zone.
- (c) Hot water return mains for each zone.
- (d) Heating supply and return distribution for each zone.

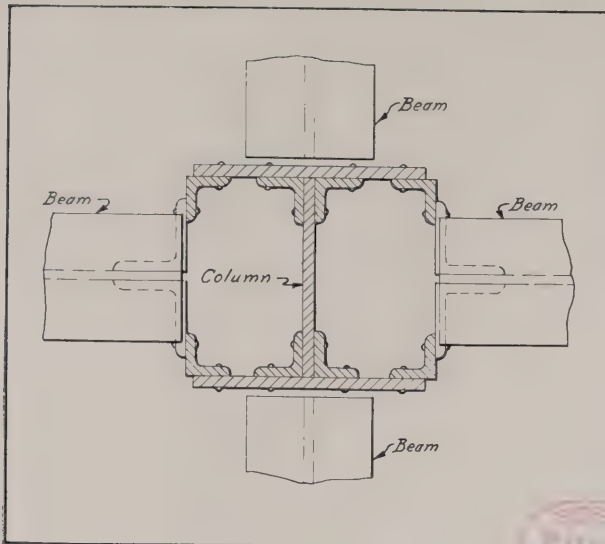


Fig. 3

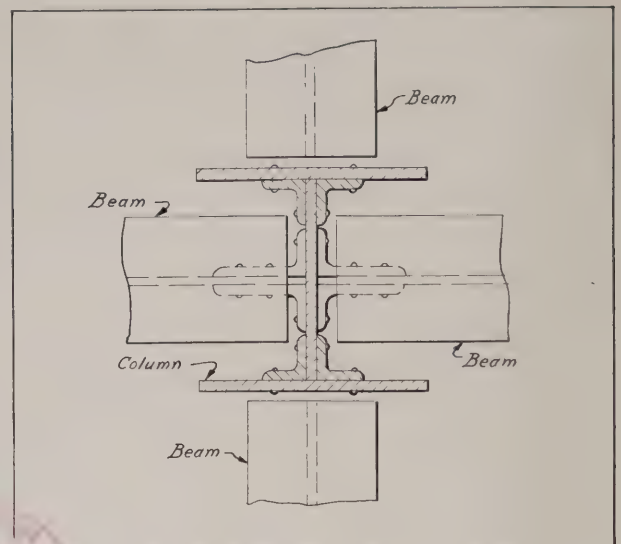


Fig. 4

This is accomplished by placing the hung ceiling over the story just below the tank room and placing the tank room two stories above the particular zone which the tank may serve.

Pumping to House Tanks. In the matter of filling these tanks with water for the various zones and the keeping of them filled when each has a different amount of water taken from it each hour in the day, some real difficulties have presented themselves. It is not economical to pump all the water required in the building up to the highest house tank and then let it run down through consecutive tanks with ball cocks until the lowest tank is reached, because this means pumping all of the water to the highest portion of the building when some of it is only required in the lower portions, involving a considerable waste in electric power. Moreover, an extremely high-pressure pump is required to operate against gravity heads of 500 to 1,000 feet, to which must be added

the pipe friction. This has led to the adoption of the scheme of locating a pump in each and every tank room. Each pump then uses the tanks in that room as suction tanks and lifts the water from the zone in which the pump is located into the tank of the next zone above; here another pump takes the water from the tank and raises it into the next higher zone. It is self-evident that with such an arrangement the water used in each zone is pumped no higher than the tank supplying that particular zone.

Pump Capacities and Control. The capacities of these pumps are carefully graded so that the higher pumps can never dry the lower house tanks, as this would interfere with the water supply for the lower zones. To forestall any such possibility, the capacity of the pumps is steadily reduced from the lowest pump to the highest. Thus, if the basement pump has a capacity of 100 g. p. m., then the pump in the

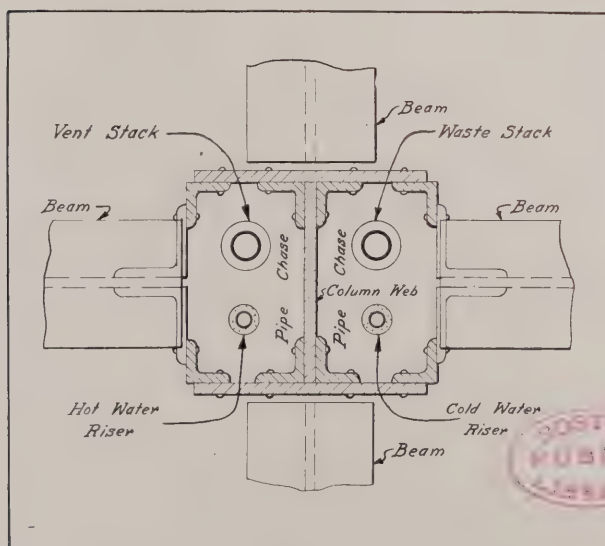


Fig. 5

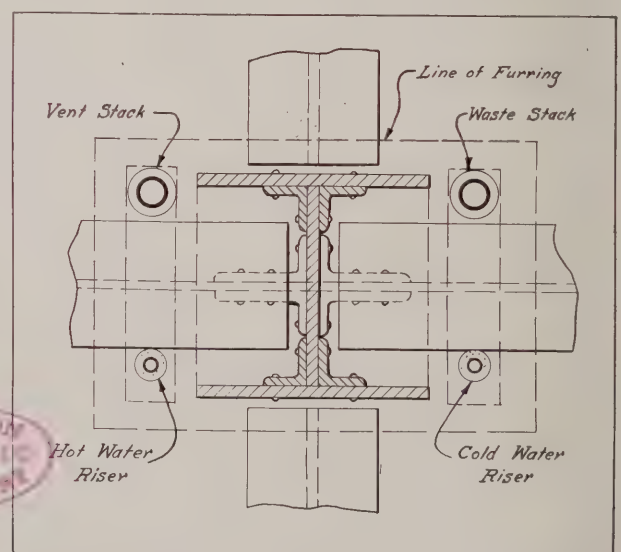


Fig. 6

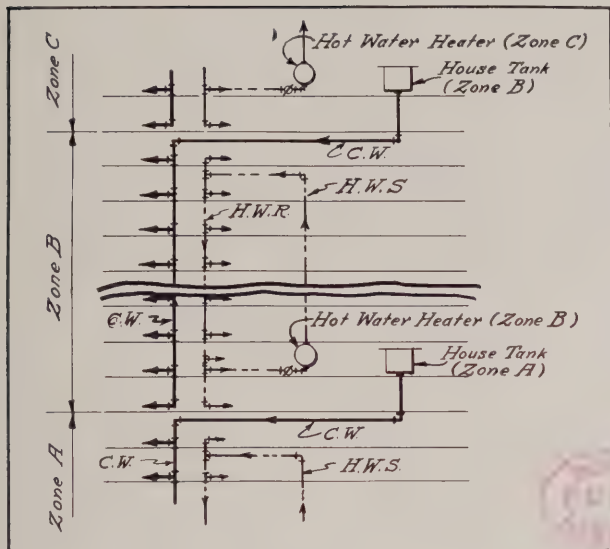


Fig. 7

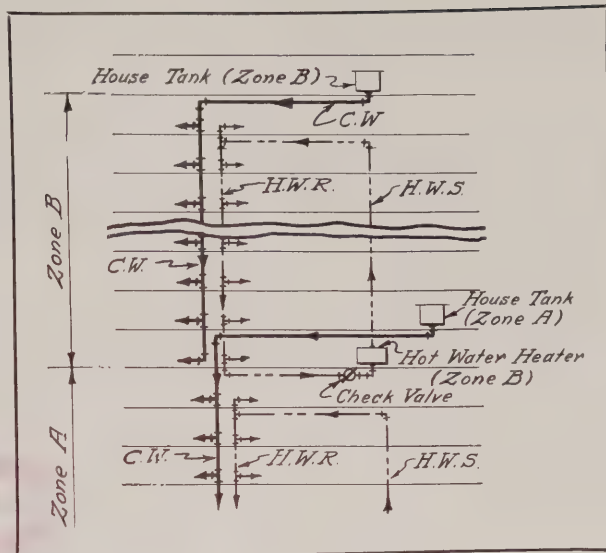


Fig. 8

next higher zone should have a capacity not to exceed 80 g. p. m.; the next higher pump not over 60 g. p. m.; then 40 g. p. m., and so on. Usually the decreasing floor area in the upper sections will quite justify the cutting down of the house pump capacities in the upper zones. Pumps should be installed in duplicate sets with one for reserve and should have float controls from the tanks into which they discharge. The heads on the pumps will be governed by the vertical height and pipe friction as in any pumping installation. Pumps are generally of the centrifugal type, directly connected to motors and set on a common bedplate. Throw-over switches should be provided in the control wiring from the house tanks, so that either pump can be thrown into service as desired.

Roof leaders, owing to the numerous setbacks, occur at frequent intervals in the tower type of building. Here again, hung ceilings should be provided directly under the roofs of the setbacks, not only for leader boxes located in the roof immediately above, but to provide space in which leaders from the roofs above may be offset. The same space will also serve for the heating risers, and so it is doubly useful. In cases where it is intended to carry leaders down the outside, the roofs should be arranged to pitch toward the outer parapet, so as to bring the leader boxes as nearly vertical over the leaders as possible. It frequently happens that space is not available at the window pilasters to accommodate large leader lines as well as the heating risers; the alternative in such cases is to slope the roofs toward the middle of the building and to carry the leaders down in pipe shafts. It is not always advisable to join leaders from upper levels with those of lower roofs until the lower leaders have dropped down a couple of stories so as to have a head of water in the lower leader. There is an old saying that if the roof water can once get into the leader it will go. But if leaders are small, or if they are temporarily

overloaded by a miniature cloudburst, it is very easy for the flow from the higher roofs to retard the incoming water from the lower roofs if connections are made too near the level of the roof outlets from the lower levels.

There is generally allowed 1 square inch of leader area to every 200 square feet of roof or other drainage area. This is the ratio customarily used in New York. In localities where very heavy rains are experienced, as in Pittsburgh, it is safer to use only 150 square feet or even 100 square feet of roof to 1 square inch of leader area to take care of short but exceedingly heavy rainfalls.

In designing high buildings it is sometimes forgotten that the water caught in setbacks may be increased by rains which do not fall in a truly vertical direction. The maximum amount of water which could be caught on the roof of any setback is governed by the area of the setback roof plus the area of the side of the building from the setback up to the next higher roof when projected at an angle of about 60° from the vertical. Reference to any high building elevation will show that if the rain is assumed to be falling at an inclination of 60° from the horizontal, or 30° from the true vertical direction, the setbacks on one side of the building will not only have to provide for carrying off their own normal rain water but will also receive a certain additional quantity which will strike the side of the building above the setback. This is indicated in Fig. 10, and it will be seen that the area which should be figured for any setback roof with a vertical wall at the back is the projected area of the roof and wall taken at 60° from the horizontal. In horizontal leader lines the sizes may be based on the "flow of sewers," which is given in almost any handbook, or it may be governed by the local plumbing code. In cases of combined roof leader and soil drainage systems it is customary to jump the size of the horizontal leader line one pipe size over that actually required

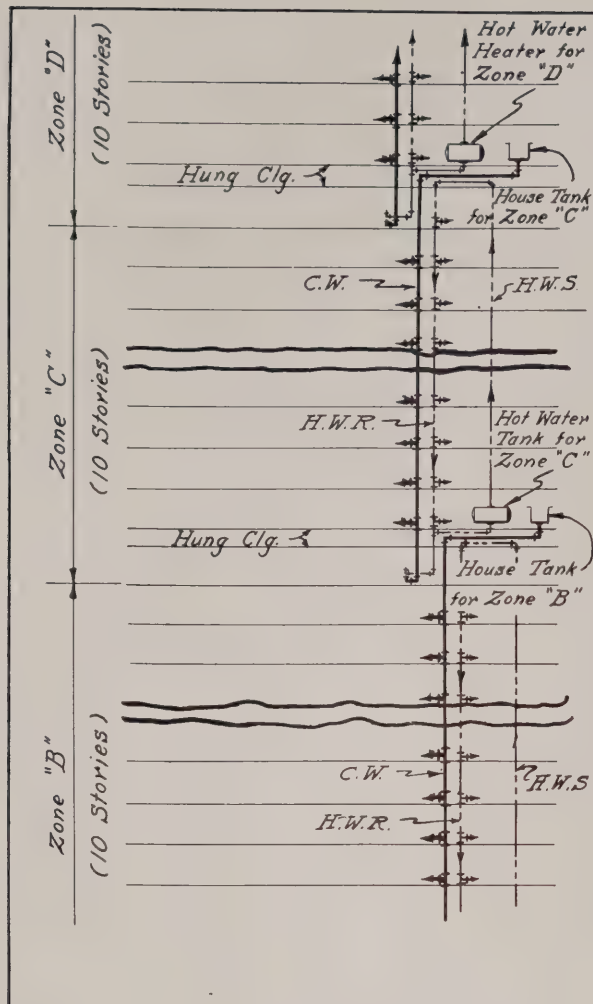


Fig. 9

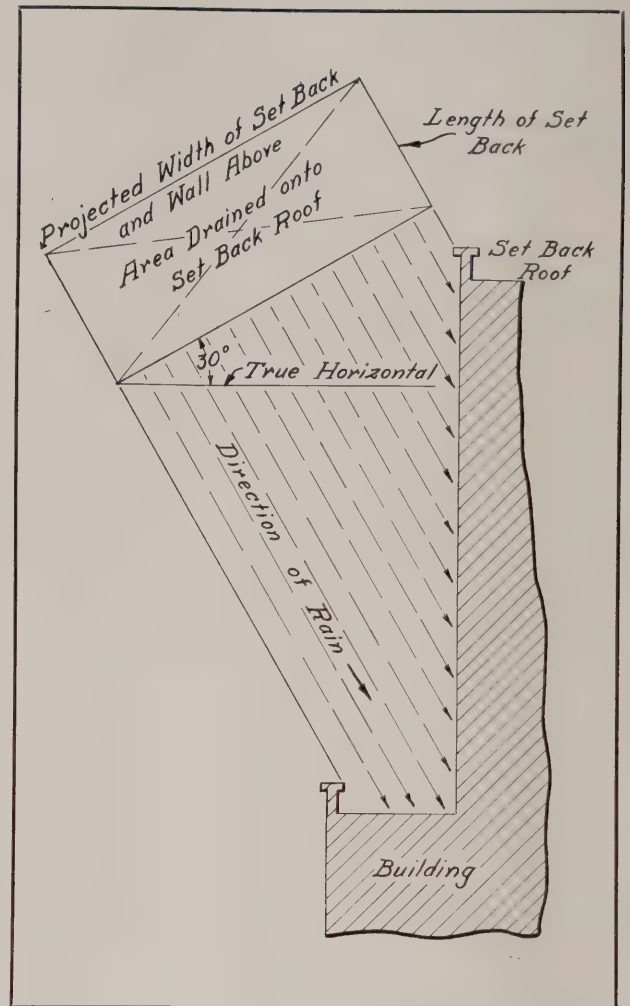


Fig. 10

to carry off the roof water, the extra area being usually more than sufficient to provide the necessary capacity for the soil and waste lines even during heavy rains.

Snow Melting Pipes. In vicinities where very low outside temperatures are encountered, snow melting pipes are often utilized. These are for the purpose of melting out the gutters over to the leader box, so that the leaders cannot become clogged with ice even when the combined action of the sun and the building warmth causes the snow on the roof to melt. They are usually made of perforated brass pipe with perhaps $\frac{1}{8}$ -inch diameter holes on 2-inch to 4-inch centers, and the size of the pipe is made sufficient to supply all the holes with steam at full pressure; the end of the pipe is capped. The pipe is set 2 inches or 3 inches above the bottom of the gutter, with perforations pointing down. These perforated pipes

are provided with valves inside the building and should be supplied with steam of at least 10 to 15 pounds gauge pressure. The ordinary heating system steam will usually not have sufficient pressure to satisfactorily operate these lines.

It is often necessary to make a steam connection to the leader just below the leader box so as to heat the leader pipe near the top as well as to thaw out the roof outlet. Unless this is done the action of the whole scheme may be prevented. These snow melting pipes and their cost of installation do not reach as high a figure as might be at first supposed; they have not returns to consider, and each roof,—or even each part of each roof,—may be thawed consecutively so that the risers are never carrying a very heavy load. Probably a 2-inch or 3-inch main steam pipe riser would be sufficient for any high building whose ground area does not exceed 200 x 300 feet.

A NEW WAY TO DETERMINE ECHOES

BY

R. F. NORRIS

ACOUSTICAL ENGINEER

TO determine the proper period of reverberation for given auditoriums is not difficult, nor is making an estimate of the proper amount of sound-absorbent material necessary to obtain the desired acoustical results. This phase of the subject of acoustics has been clarified. With patience and care, the proper period of reverberation of echo in a room may be determined from formulæ, and an acoustical correction may be computed.

Sometimes, after the proper period of reverberation in an auditorium has been ascertained, one finds places in the room where it is extremely difficult to hear. These places are usually called "dead" spots and are caused by the concentration of reflected sound that is out of phase with the direct sound by one-thirtieth of a second or more. To get rid of these spots, one must find the reflecting surfaces which cause them, then change the shapes of the surfaces or treat them with enough sound-absorbent material to eliminate the disturbing

reflections. Several methods have been employed for the detection of "dead spots." An ingenious plan developed by Prof. F. R. Watson of the University of Illinois uses an arc light at the focus of a parabolic reflector. A beam of light is cast and a hissing sound emitted simultaneously by this instrument. The apparatus may be set up on the stage of the auditorium to be tested, and the beam of light directed against any portion of the room's interior. By placing mirrors on the surfaces against which the beam of light is directed, the path of the light after it is reflected may be noted. A sound is reflected in much the same manner as a light beam. In an auditorium being thus tested, the sound may

be heard distinctly if the ear is moved into the path of the beam of light. By careful and assiduous manipulation of this apparatus, a thorough survey can be made of any auditorium, its "dead spots" plotted, and the surfaces which cause them determined. Then one may either change these surfaces in shape or pad them with a sound-absorbent material to eliminate the cause of the disturbance.

Another method, developed by Dr. Paul Sabine of the Riverbank Laboratories, involves making the model of a cross section of the auditorium to be studied, and the production of a very intense, single-sound wave at the spot where the speaker stands. This sound wave is then photographed. The machine may be timed so as to photograph the sound wave at any increment of time after it has left the source. In this way, a series of photographs may be taken, each one showing the spherical sound wave as a ring, expanding away from the source. With a succession of these photo-

graphs, the progress of the wave may be noted, its reflection from the various surfaces studied, and the disturbing surfaces determined. A third way of studying an auditorium in regard to its echo-producing surfaces is to lay out the significant sections of the room, then in each section take the speaker's location as a source, and draw lines or rays out to all the boundaries of the section from this point. The rays are assumed to reflect at an angle which is equal to their angle of incidence, and are reflected into the auditorium. These rays then show the paths in which sound travels after its first reflection. If a great number of these rays are accurately drawn, and the angles of incidence and re-



Fig. 1

Camera Mounted Above Section of an Auditorium, as Used in Studying Echoes

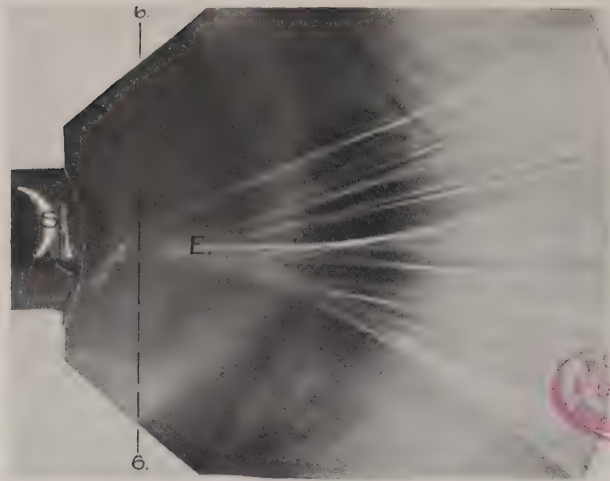


Fig. 2

Photograph of Plan Section of Uncorrected Auditorium Showing Sound Focus at E

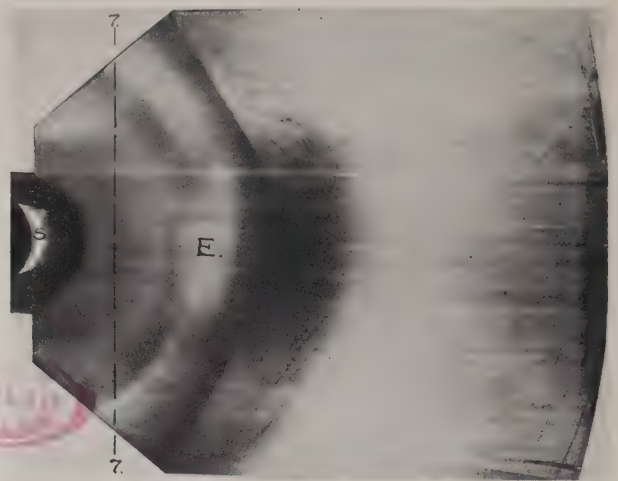


Fig. 3

Photograph of Plan Section of Corrected Auditorium Showing No Sound Focus

flection carefully measured, the resulting picture gives a fair idea of how the sound acts.

Of the methods mentioned, the first is applicable only to auditoriums which have been erected; it cannot be used on the sketches of proposed auditoriums. The models employed by the second method may be made from the architects' sketches of the room, but this method is laborious and time-consuming, due to the necessity of building plaster models of the various cross sections of the auditorium to be studied, and because carefully timed photographs are essential. The third method is applicable to auditoriums of which the plans are available, and it can be utilized in the case of buildings which are only in the sketch state. It had previously been employed by the Burgess Laboratories in making acoustical analyses of rooms before the buildings had been erected, or even fully designed. This method consumes so much time, however, that an accurate short cut was sought.

The significant sections of a room to be studied are usually: (1) the floor plan, (2) longitudinal section, (3) cross sections. They are laid out in line on a stiff white paper (Fig. 1). The section to be studied first is placed on a flat surface, and a highly polished strip made of metal $\frac{1}{2}$ -inch wide is placed along the boundary lines of the section, the width (the $\frac{1}{2}$ -inch dimension) being perpendicular to the plane of the section. This strip is bent to conform to the outline of the section, and is held in place by weights similar to spline weights. The section is then placed in a darkened room and a small bulb situated at the source of sound is lighted. The reflections from the polished metallic strip are found to make the same pattern on the surface of the paper as would be obtained if one should carefully construct lines representing all the rays of light from the same point and from the reflecting surfaces. This method gives results more accurate than those secured by drafting, and in a fraction of the time required for that method.

Although sound is reflected in the same manner as is light, sound is of such a long wave length in comparison to light that it is much more easily dispersed. Consequently, the engineers studied with extreme care this detail in their method of analysis, since light was employed in place of sound. Under the older method, where the rays of sound were laid out on the drafting board, they were laid out as rays, and no provision was made to correct for the dispersion of the sound. The new method is more accurate than the old, because the likelihood of there being drafting room errors in working out all angles of incidence and reflection is eliminated.

Several auditoriums were laid out and thoroughly studied by the old drafting table method. Small models were then set up with the reflecting walls, using an electric light at the speaker's position. The resulting patterns cast on the paper were found to coincide almost exactly with the patterns obtained from the drafting method. It was only necessary, then, to devise some way of making a record of the light patterns which were cast in the auditorium sections. This was done at first by setting up the sections on photographic paper in a darkened room. The bulb was placed at the desired position and lighted. The intensity of the light is greater where the light is reflected from the walls in addition to the general lighting, so that paper is exposed more at these places, and a shadow picture of the reflections is obtained. In studying the effects of the reflected sound, pegs or pins inserted at different points along the floor and balcony of the auditorium (in the cross section at points in which auditors would be stationed) proved to be exceedingly helpful. These pegs cast shadows which pointed directly away from the surfaces from which the light was being reflected. By reversing the direction and following these shadows, each surface causing a shadow was found. If the distance from the source of the sound to any one of the surfaces and then onward to the listener were greater than the direct distance from

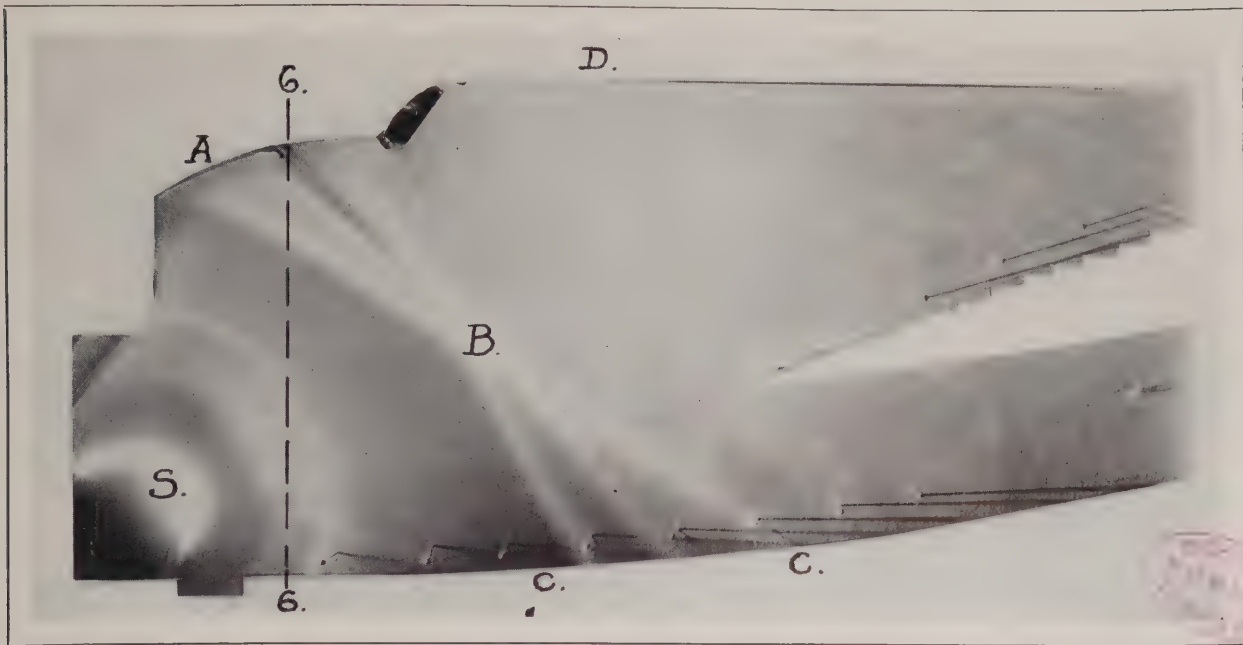


Fig. 4. Longitudinal Section Through Auditorium Showing Echoes at C-C

the source to the auditor, a confusion of the sound would be heard. If the difference in the two paths were more than 70 feet, an echo would be heard; if it were less than 70 feet but more than 35 feet, a blurring effect would make it hard for auditors to understand the speaker.

Referring to Fig. 2, which is the plan view of an auditorium, it will be seen that, with a source at S on the stage, there is a reflection from each side wall toward the center of the room, and that there is a reflection from the rear wall which concentrates at E. The reflections from the side walls are everywhere divergent and do not come to a focus. For this rea-

son, the intensity of this reflection to any single auditor is small, and in all probability would cause no disturbance. Investigations in actual rooms have proved this to be the case. The concentrated reflections at E, however, produce an irritating conflict of sound waves in this region. In Fig. 3 the curvature of the rear wall has been changed, with the result that all of the concentration at E is eliminated. The sound from the source at S is now reflected in paral-

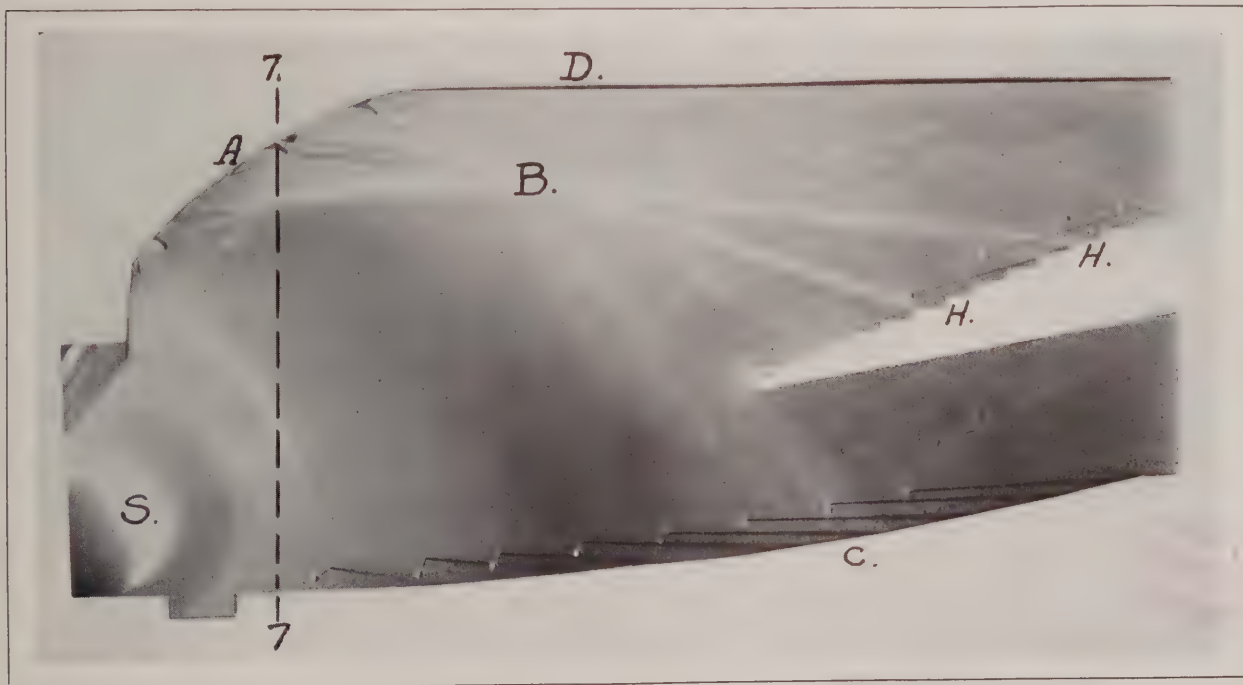


Fig. 5. Longitudinal Section Through Auditorium Showing Elimination of Echoes and Sound Reinforced in Balcony

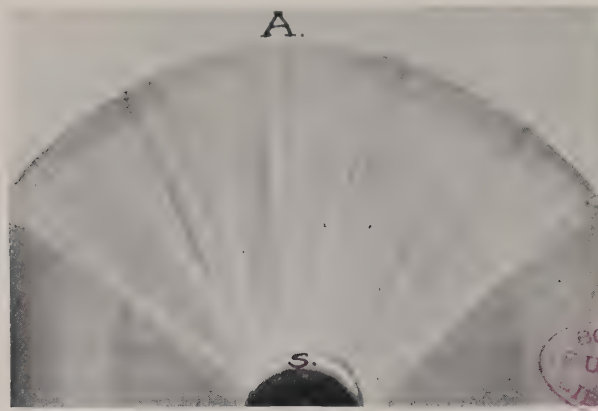


Fig. 6

Transverse Section Through Auditorium Showing Concentration of Sound Due to Ceiling Curvature

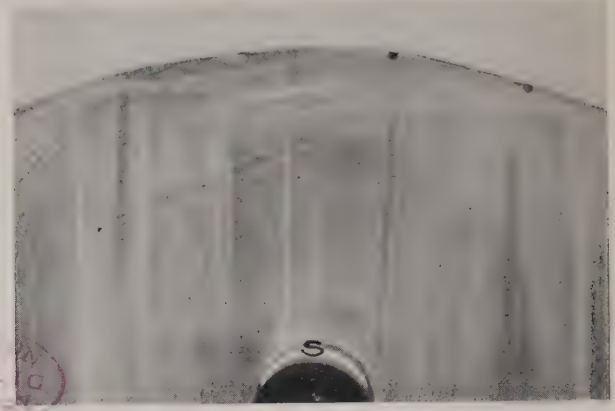


Fig. 7

Transverse Section Through Auditorium Showing Changed Curvature Eliminating Sound Concentrations

lel lines, and the intensity of the reflection at any given point is small. A wall of this type produces no disturbing echo. From these two figures, it is easily seen that the curvature of the rear wall should not be greater than that shown in Fig. 3.

The next two diagrams, Fig. 4 and Fig. 5, show longitudinal sections of the auditorium. Fig. 4 shows the auditorium as originally designed. The ceiling surface nearest the proscenium arch is curved in both directions, and the main part of the ceiling is flat. When this section was set up for study, the reflections from this first ceiling surface A, with the sound source at S, showed a decided concentration of sound at B. This sound then diverged and covered an area (C-C) at the floor level. In this section pegs were inserted along the floor and balcony surfaces to simulate auditors. The fourth, fifth, and sixth pegs from the stage cast two shadows. One, when prolonged past the peg, intersected the source; the other, similarly prolonged, touched a portion of the ceiling surface A. Lines drawn from the source to the points where these prolonged shadows intersect this ceiling surface would properly represent the path of the sound. Since these sections were made to a definite scale, the distance traveled by the direct sound and that traveled by the reflected sound could be accurately measured. If the difference in these distances is more than 35 feet, acoustical trouble over the area C-C occurs. It will be noted that the seventh peg from the stage also casts two shadows. The secondary shadow, when projected through the pin, intersects the ceiling surface D, which is flat. For this reason, as in the case of the floor plan, the reflected sound does not come to a focus, but is everywhere divergent, and is so dispersed when it reaches the auditor as to cause no troublesome echo or blurring.

In Fig. 5 the ceiling surface A has been changed. The curve has been started lower at the stage, and has been run to meet the surface D. The reflections from this surface are not directed into the main floor of the auditorium as they are in Fig. 4, but are thrown back into the balcony, striking the area H-H.

The pegs along this area now cast double shadows, one of which when prolonged from the peg passes through the source. The second intersects the ceiling surface A. Again, if lines are drawn from the source to these points of intersection, the paths of the direct sound and reflected sound may be measured. It will generally be found that in a case of this kind, the difference between the two paths is relatively small,—less than 35 feet,—and that the reflected sound acts as a reinforcement of the direct sound, and improves audition in the balcony seats. Notice that the reflection indicated at C is unchanged, but as before said, this reflection is from the flat ceiling surface D, and has no bad effect on audition at this point.

Fig. 6 and Fig. 7 show transverse sections through the auditorium at the line 6-6 in Fig. 2 and Fig. 4, and at line 7-7 in Fig. 3 and Fig. 5. In Fig. 6 the transverse curvature of the ceiling surface A is great. The effect of this is that the sound is concentrated toward the center of the auditorium. A concentration in this direction aggravates the disturbance, due to this surface. Even when the longitudinal curvature of this surface is changed to throw the reflections into the balcony, a surface having this pronounced curvature is certain to cause a concentration of reflected sounds in the middle of the balcony, and this will be distinctly uncomfortable to auditors there. When this curvature is changed, as it is in Fig. 7, the reflected sound travels in practically parallel rays which tend to distribute the sound evenly over the balcony surface. The apparatus used at the Burgess Laboratories to make this diagnosis of acoustical defects is shown in Fig. 1. This illustration shows a cross section of an auditorium erected for study. When laid out in miniature in this way, the auditorium may be studied directly by observing the reflections from the different surfaces. These surfaces may be quickly and conveniently changed, and the resulting change in pattern is instantaneously seen. If a record of any one set-up is desired, the open side of the box is closed and a photograph is taken, camera mounted above model.

HEATING AND VENTILATING FOR THE ARCHITECT

BY

PERRY WEST

CONSULTING HEATING AND VENTILATING ENGINEER

Editor's Note. In this article Mr. West takes up the practical standards in regard to temperature, humidity and air motion requirements. He considers the questions of artificial ventilation; the ways of determining whether or not such ventilation is necessary and, if so, the character of the ventilation to be provided; and air conditioning. The first article of this series by Mr. West appeared in THE ARCHITECTURAL FORUM for April, 1928, Part Two.

CONSIDERING the matter offhand, the heating of a building is a simple problem, but when thoroughly analyzed it is found to present a number of interesting sides which are well worth the consideration of the careful designer. Good heating consists in the maintenance of comfortable temperatures throughout the occupied spaces of any building, an economical "process temperature" where required in manufacturing buildings, and enough heat elsewhere in all classes of buildings to prevent freezing of pipes, etc. An important consideration in any of these cases is the maintenance of the required temperature where it is needed, with as little waste as possible in the adjacent spaces where heat is not required. This is of importance in all kinds of buildings, but especially where heat may be required at or near the floor, where because of the natural tendency of heated air to rise, there may be a high degree of overheating in the upper spaces, with much unnecessary loss of heat through the upper walls and roof. Heat may be required in certain parts of a space only. In such cases the problem is to control the heat so as to establish the required conditions where needed and waste as little heat elsewhere as possible. Recent research has shown that much economy may be had by confining the heat to the 6-foot height of rooms, thereby preventing the usual difference of about $1\frac{1}{2}^{\circ}$ Fahr. per foot in height between the floor and ceiling. This difference may be reduced to about $2/10^{\circ}$ Fahr. with some of the newer types of radiators or concealed heaters. This may mean a saving of 40 per cent in extreme cases, and something over 10 per cent ordinarily.

Theory of Heating Standards. When we speak of the "temperature," we generally refer to the "dry bulb" temperature. This measure of temperature is of little value for determining the conditions of comfort for human beings or the proper atmospheric conditions for the processes of manufacture. Recent research at the American Society of Heating and Ventilating Engineers' Research Laboratory, operating in conjunction with the United States Bureau of Mines and the United States Bureau of Public Health, has shown that there are three important factors which go to make up the effective temperature, or the physiological temperature effect which atmosphere will exert upon human beings. These are *dry bulb* temperature, *wet bulb* tempera-

ture, and *air motion*; on them our comfort depends.

The *dry bulb temperature* is that taken with an ordinary thermometer (usually reading in Fahrenheit degrees), and this represents the temperature of the air without reference to the effect of its moisture content.

The *wet bulb temperature* is that taken with a similar thermometer, which has its bulb encased in a silk mesh bag; the reading being taken after the bag has been moistened with clean water and the instrument has been whirled through the air until the indication has become stable. This wet bulb temperature takes into account the conditions of the atmosphere as to its moisture content, due to the fact that the rate of evaporation of the moisture from the bag and the consequent cooling of the thermometer bulb, caused by this evaporation, depend upon the relative amount of moisture in the air.

By *air motion* is meant the velocity of the air in feet per minute. Its effect is that of a breeze, in removing the enveloping air and bringing new air to take its place, thus producing a cooling effect by increasing evaporation.

The combined effect of these three factors is designated as the effective temperature. An idea of the relative importance of these factors may be gained by taking an ordinary dry bulb temperature of 70° and considering that there is an effective temperature of 60° when the air is absolutely dry and without motion, an effective temperature of 50° when dry and with an air motion of 500 feet per minute, and an effective temperature of 70° when fully saturated and without air motion. These factors have a similar bearing upon the effect that an atmosphere will have upon processes or products of manufacture. They affect the drying, cooling, heating, expanding, contracting, hydrating, dehydrating, cracking, warping, sweating and other effects and variations which any particular or varying atmospheric conditions may exert upon the product.

The effective temperature, not the dry bulb temperature or the wet bulb temperature, or both without the consideration of air motion, determines the heating requirements as far as the health, comfort and efficiency of workers or the quantity and quality of products of manufacturers are concerned. The exact physiological effect of these factors has been established by the American Society of Heating and Ventilating Engineers' Research Laboratory, as illustrated by the accompanying chart shown in Fig. 1. This shows the effective temperature chart for human beings at rest in still air with different dry bulb and wet bulb temperatures corresponding to different percentages of relative humidity, or moisture in the atmosphere. The relative humidity is

calculated from the difference between the wet and dry bulb readings. This chart is made up of vertical isothermal lines representing the dry bulb temperature, as shown on the horizontal scale at the bottom; horizontal lines, representing the grains of moisture per pound of dry air as shown on the vertical scale at the left; light oblique isothermal lines sloping downward toward the right, representing the wet bulb temperatures as shown in the scale along the upper curved line; heavy oblique effective temperature lines, representing the effective temperatures as shown on the same scale as the wet bulb temperatures; and the oblique curved lines, representing the relative humidity in percentages of the quantity of moisture required to saturate air at the particular dry bulb temperature under consideration. The shaded section between the effective temperatures of 62° and 69° covers the conditions of substantially equal human comfort and is designated as the "comfort zone." The effective temperature of 64° is the optimum for the average human being at rest in still air, and is designated as the "comfort line."

To use this chart, start with the dry bulb temperature, for example, of 70° , at (A) and follow the vertical line to its point of intersection with the wet bulb temperature, say of 57° , at (B). The curved line passing through this point of intersection will represent the relative humidity, which in this case happens to be 45 per cent. Starting from (B) a line drawn parallel to the nearest effective temperature line to the scale of effective temperature will intersect this scale at the effective temperature reading, which happens to be 64° in this case. Starting again from (B), a horizontal line will intersect the scale of moisture contents at the number of grains per cubic foot of air, or 44° . Similarly, by starting with any two known factors, the other may be found. The example represents the optimum effective temperature condition for a dry bulb temperature of 70° . It will be seen that for this dry bulb temperature the moisture contents may be varied between 24 and 100 grains per cubic foot, corresponding to a variation from 28 to 92 per cent of relative humidity, and an effective temperature variation from 62° to 69° degrees, without getting outside the comfort zone in either direction.

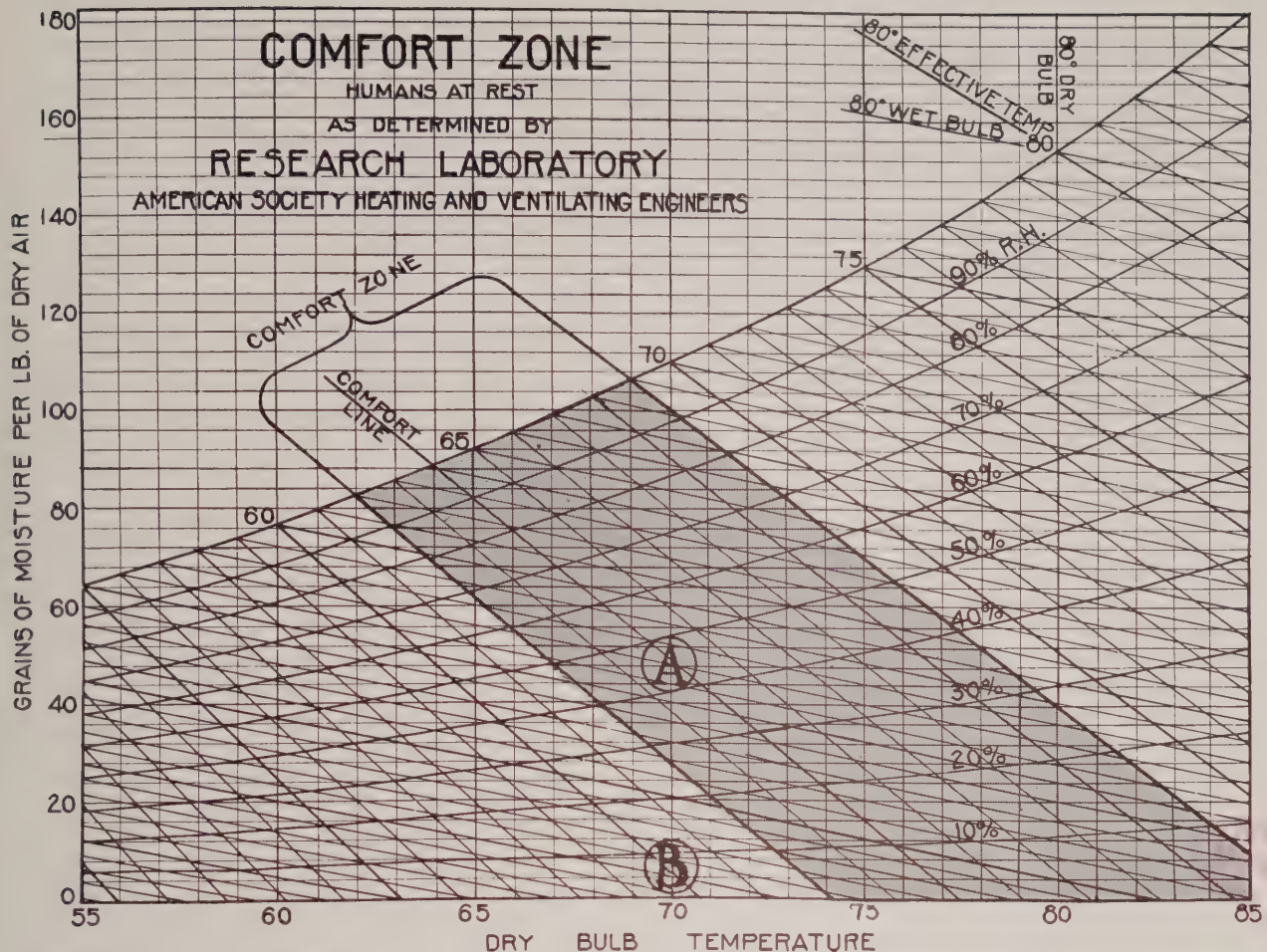
It should be borne in mind, however, that this comfort zone covers the extreme limits for health and comfort, and that the nearer the conditions are kept to the comfort line the more ideal they will be. It should be noted that around 70° dry bulb the allowable variation in humidity is greater than at temperatures far below or above. Also the dryer the air the hotter it must be, and the more moist the air the cooler it must be, in order to produce the proper degree of comfort. It should be noted in connection with air motion that a dry bulb temperature of $76\frac{1}{2}^{\circ}$ with 150 feet per minute air motion, and $82\frac{1}{2}^{\circ}$ with 500 feet per minute air motion, are required to meet the comfort line requirements of 70° without air motion, with 45 per cent relative

humidity in each case. Also that the widest allowable variation in humidity is near these temperatures.

There are conditions, therefore, under which moisture in the air assists the cooling effect of air movements, and other conditions under which it retards it. This is why the wind makes one feel colder on a cold, damp winter day and hotter on a hot, damp summer day. So far we have discussed the conditions pertaining to human beings at rest. For those actively engaged in work, there is considerable variation from these conditions of comfort, depending upon the character of the work. These conditions have not been very accurately determined as yet, but present indications are that for human beings at hard work the effective temperature may be reduced at least 5 degrees, as far as health and comfort are concerned. Some recent studies throughout the industries indicate that male workers show best results at a temperature of 72° and a relative humidity of 40 per cent, and female workers at 80° and a corresponding lower relative humidity, with both conditions corresponding to an effective temperature of about 65° .

It has long been known that overheating is very enervating and greatly lowers the capacity of workers, but this condition cannot be diagnosed from the dry bulb temperature alone. If the humidity is decreased in proportion, the temperature may frequently be increased with advantage, as shown by these studies. Studies of the New York Commission on Ventilation indicated that the capacity of workers is reduced about 28 per cent with a temperature of 78° and a high relative humidity as compared with a temperature of 68° and a low relative humidity. This report is not definite, but the higher temperature and humidity would probably correspond to an effective temperature of 75° and the lower conditions to about 63° . It is fairly safe to say that an increase of each degree in effective temperature will decrease the capacity of workers about $2\frac{1}{2}$ per cent. These studies are being further carried out, and more definite results will be forthcoming, but it can be seen that the data already available are very useful if properly understood and applied. The reason that the data on proper standards of heating are not more definite is that the physiological reactions upon human beings are so different and indefinite that a great amount of very careful and laborious research is necessary to determine the exact conditions of comfort, and vastly more to determine the effects on health, efficiency and longevity. In the effects upon processes and products, the determinations are much easier and the available data much more exact. For this reason it is sometimes found that better heating and ventilating conditions are maintained for making chewing gum, candy, tobacco, textiles and other products of manufacture than for the employees working in the factories producing them.

Practical Heating Standards. The proper standards for heating comfort where the occupants are



From the A. S. H. & V. E. Guide

Fig. 1. Chart Showing Relations of Temperatures and Humidity to Comfort

not engaged in manual labor, is from 62° to 69°, with an optimum of 64° effective temperature, but as already pointed out, the dry bulb temperature necessary to produce these results may be varied from 62° to 90°, depending upon the relative humidity and air motion. Optimum conditions for all of these factors are perhaps around 70° dry bulb, 45 per cent relative humidity, with a light air motion. Where occupants are performing light work, the dry bulb temperature may be reduced to 67½°, and where performing heavy work to 65° with 60° as the low limit. Departures from these standards will represent a loss in comfort and efficiency of about 2½ per cent per degree.

In producing these results it is necessary to take into account not only the heat to be supplied by the heating and ventilating equipment, but the body heat given up by the occupants themselves, as well as the heat given off by the lighting, motors and other equipment, and these must be properly balanced against the heat losses from the building. In special cases where furnaces or other large heat-emitting sources are present, it is important to know the exact physiological effects which these will produce on the occupants, as it sometimes involves a problem of cooling by air motion or other means to pre-

vent overheating at these points, and at the same time maintain sufficient heat elsewhere in the room. The Kata thermometer, which is an instrument which can be held at body temperature and at the same time record the rate of heating or cooling effect of surroundings, is used to determine the conditions to be met in such cases.

Kinds of Heating Apparatus to Use. Cast iron boilers are desirable for residences or small buildings, or even for larger buildings where low pressures are carried and load fluctuations are small. They have the advantage of high resistance to corrosion, ease of rigging to the point of erection, flexibility in the addition or replacement of sections, low first cost, and small space requirements. Steel boilers of the fire-box or self-contained types are desirable for larger buildings with fluctuating loads and higher pressures, and have larger water and steam storage capacity, great tensile strength, freedom from cracking, high economy, quick response and capability of being forced. Water tube boilers are desirable for high-pressure plants where large capacity must be gotten into small floor space and where the duty is heavy and continuous, loads fluctuating, and extreme safety an important item.

The use of oil fuel is largely a matter of choice

and opinion with the owner. Generally speaking, it is cleaner and requires less labor than coal, is more easily stored, and requires less space. It is not a panacea for all fuel troubles, as oil burners depend on electrically or steam-driven machinery which must be kept in repair and is subject to many difficulties if not properly installed, understood and taken care of. Here again the psychology of the situation should be well considered, and use of oil should not be forced on unwilling owners or operators, as it takes good will, good service and good operation to make it successful. In residences, schools and small buildings generally, where expert operating organizations are not in charge, the lighter oils which are subject to automatic control should be used. The cost of heating with oil at about 10 cents per gallon is equivalent to that with \$15 coal. The cost of the apparatus will add from 20 to 50 per cent to the cost of the heating system, most of which is offset by the saving of space, especially in larger buildings. In larger structures heavy oil may be used at from 4 to 5 cents per gallon, which is equivalent in cost to heating with coal at from \$6 to \$8 per ton.

Gas fuel is very satisfactory; requires little space; is entirely free from dirt and labor; and susceptible to ready automatic control. Its cost with the ordinary heating system and at \$1 per 1000 cubic feet of 500 B. t. u. gas, is equivalent to that with \$32 coal.

Concealing radiation in recesses or cabinets is being done to a great extent, but care should be taken to see that this is done so as not to interfere with proper heating (see pages 77 and 78 of the American Society of Heating and Ventilating Engineers' Guide, 1928). Concealed and cabinet radiators are fast coming to the front and are very effective and economical, but have hardly been in use long enough to determine the effect of dust and lint collecting between the fins, or to demonstrate as to how they stand up otherwise after long usage. Radiation with a preponderant radiant factor as compared with ordinary radiators which operate largely on the convection principle, has recently been developed. It is claimed that this new type gives the same degree of comfort in the lower parts of small rooms as the other types of radiation, but with appreciably less heat input. It is interesting to note that the concealed or cabinet radiators tend to accomplish the same purpose by causing a more rapid and extensive circulation of air in the lower portions of small rooms to and from the radiator, thus reducing the overheating of the air in the upper parts and reducing the heat loss. These new developments seem to be along the right lines. Their tendency is toward more efficient heating with much better opportunity for artistic treatment than afforded by the architect's old enemy,—the radiator.

The Ventilating Problem. Ventilation perfection is a very definite thing, and may be thus defined: that atmospheric condition in every part of indoor space occupied by human beings which is continually maintained with a proper amount of oxygen;

free from dust, bacteria, objectionable odors; poisonous and other objectionable substances; with suitable air movements, and at the temperature and humidity condition within the zone of human comfort as scientifically determined. Good ventilation may be considered as that percentage of perfection of these factors which is warranted by the requirements of human health, comfort and efficiency on the one hand, and expense and labor to produce these conditions (whenever they do not naturally exist) on the other. In the popular mind the general subject of the theory and practice of ventilation is in a state of complete flux. There is, however, a very rapid crystallization toward very definite standards and practices.

Is Ventilation Necessary? The answer to this depends upon the particular requirements for the space in question, but generally speaking, any space within which the atmospheric conditions cannot be naturally maintained within the range of comfort can well be given the best mechanical ventilation devisable. It is no longer felt that the chemical composition of the air is the important factor, but that proper ventilation depends more largely upon a number of other factors which are given here in approximately the order of their importance:

1. Air supply.
2. Air temperature.
3. Air cleanliness in reference to its freedom from dust and other suspended matter.
4. Air sanitation with reference to its freedom from bacteria.
5. Relative humidity.
6. Distribution.
7. Air motion.
8. Freedom from odors.
9. Freedom from other injurious substances.
10. Freedom from monotony, in regard to noise and too much regularity of indoor conditions.

Air supply is put at the head of the list, because without air supply there can be no artificial ventilation. Air temperature is second, because it has been proved by practically all of the accredited experimenters that overheating is more detrimental to the quality of ventilation than any other one thing.

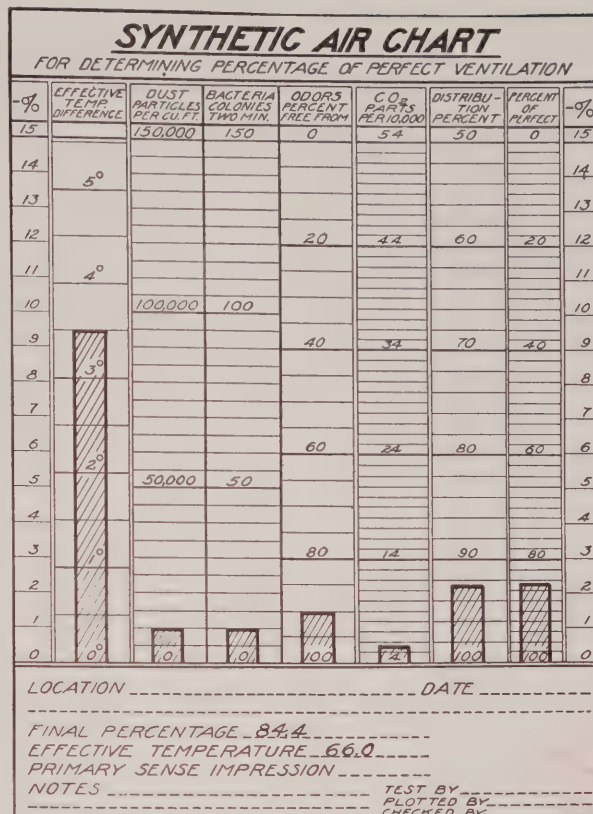
Air cleanliness is third, because it has to do with human health from the standpoint of freedom from dust and other suspended substances which irritate and clog the air passages, and from the standpoint of freedom from bacteria and other media of infection carried along with these substances. Air sanitation is fourth, as it also affects human health and is correlated with the third item. Relative humidity is fifth, not because it is of so much less importance than air supply and temperature, but because it also bears such an intimate relationship with these two items that it receives a part of its due consideration in their determination. Distribution is sixth, for a similar reason, for while it occupies a much more important place than this position might indicate, it is intimately connected with the effective air supply

because it is a factor in effective temperature. Air motion is seventh, in the same way. Freedom from odors is eighth, for the reason that odors are seldom dangerous or permanently detrimental to health, though quite disagreeable and even nauseating. Freedom from other injurious substances is ninth, because these substances are seldom found in ordinary ventilating practice and must be practically eliminated in any case. Freedom from monotony is tenth, because it has to do with the last refinements and the psychology of ventilation only.

In order to properly measure and compare the effects of these various factors the synthetic air chart as shown in Fig. 2 has been devised and adopted as the standard measure of the quality of ventilation. This chart takes air supply into account under the heading of carbon dioxide content, CO_2 . The scale for this factor is based on the assumption that 300 parts of CO_2 in 10,000 parts of air, together with the other vitiation which would accompany this quantity of CO_2 when exhaled by the human breath, might produce results that would be permanently injurious to health. For each part of CO_2 in 10,000 (above that ordinarily contained in the outside atmosphere and assumed at four parts in 10,000) a deduction of $\frac{1}{3}$ per cent is made for this particular column or department, and 0.3 per cent as the deduction in the final per cent of perfection column. The various other air factors are given their proper weight in determining the percentage rating of the ventilation conditions in the test. Air temperature, air motion and relative humidity are represented under the column of effective temperature difference. The percentages of perfection for good ventilation as thus determined range from 95 in new school classrooms to 80 in existing churches.

In the normally crowded city places of assemblage the heat given off by the occupants together with that given off by the lighting and power equipment is usually more than the normal heat loss through the structure to the outside air, even in winter under cold climatic conditions. This means that in order to preserve an equilibrium of effective temperature the entering air must be cooler than the leaving air, so that the problem is usually one of cooling and ventilating rather than heating and ventilating. In the practical work of engineers who design ventilating systems, and of architects and owners who pass upon these systems, the one item involving standards which is the basis of all calculations and layouts is the quantity of air to be handled by the system. The functions of the air are to supply the necessary oxygen for respiration, to keep the dilution of CO_2 and other objectionable substances down to the proper point, and to maintain the proper effective air temperature.

On the basis that the air brought in from the outside is for oxygen supply and dilution only, these cubic feet per minute per person would be required for the ventilation percentages shown, if all other factors are 100 per cent perfect.



From A. S. H. & V. E. Guide

Fig. 2. Chart for Recording Results of Ventilation Tests

Percentage of perfection	Cu. ft. of air per minute required per person at rest	Cu. ft. of air per minute required per person at hard work
98	15.0	30.
96	7.5	15.0
94	5.0	10.0
92	3.75	7.5
90	3.0	6.0

In theaters, assembly rooms, auditoriums and other places of public amusement and assemblage there are usually several other factors to consider, such as the removal of excess heat, excess moisture, dust raised by the movements of the occupants, and odors. We may not hope to get better than from 40 to 60 per cent ventilation in warm summer weather without some method of air cooling. Air motion will assist, but unless increased beyond the usual 10 to 20 feet per minute ordinarily obtained from the movement of the air through the room, it will not improve the percentage of ventilation by more than from 2 to 3 per cent. By the use of refrigerating and dehumidifying apparatus this effective temperature department can be maintained at any desired percentage of perfection. The use of a good air washer should reduce the temperature about 70 per cent of the difference between the wet and dry bulb temperatures. About 10 cubic feet of air taken in from the outside, per person per minute, is

sufficient for winter conditions but inadequate for summer climates, where heat and humidity are the determining factors, unless refrigeration is used. It should also be noted that increasing the air supply from 10 to 50 cubic feet per person per minute gives little improvement unless some form of artificial cooling is used.

It would seem that about 75 per cent ventilation can be obtained under reasonably severe summer conditions with an air supply of 30 cubic feet per person, using an air washer, and that beyond this point there is little to be gained by increasing the supply. It should be noted that this is based on upward ventilation and that the cooling effect of from 5 to 10 degrees with air washers of perhaps twice this amount with refrigeration will produce uncomfortable drafts on the occupants at times. For this reason and for the further reasons that it is more sanitary and more easily controlled, the downward system of ventilation is perhaps more efficacious in large and constantly used places of assemblage. On account of transporting all of the heat from lights downward and of forcing the body-heated air back over the occupants, it is usually necessary to do much more cooling of the air than can be done with the air washer without refrigeration. On the other hand, the air is brought in high enough to permit of its being diffused and brought to the proper condition before coming into contact with the occupants. It can be seen, therefore, that the air supply per person per minute for assemblies could be 10 cubic feet in winter, 30 cubic feet in summer with the air washers, and anywhere between these two figures for the entire year with refrigeration. Also that nothing better than about 75 per cent ventilation can be secured in hot, sultry, summer weather without artificial cooling, but that with cooling, especially if the air supply is taken from overhead and exhausted from below, almost any percentage of perfection can be maintained.

Recirculation. The foregoing does not take into consideration the matter of recirculation, but it can readily be seen that there is little to be gained by recirculation unless an appreciable amount of CO₂ and attendant impurities which are put into the air can be taken out during recirculation. The handling of the larger quantity of air may be of value to produce air motion or for use as a better cooling medium with less temperature difference between incoming and outgoing air. Recirculation may also be used as a purely economic feature during the warming up of the building or during periods when the space is only partly occupied and the mechanical arrangements are inadequate for properly varying the quantity of air handled to suit. A good arrangement is to provide apparatus for handling 30 cubic feet of air per person per minute with provisions for recirculating any amount up to as much as two-

thirds of this. The percentage of air recirculated may be varied to suit the seasonal change so as to conserve heat in winter and refrigeration in summer.

Where effective temperature is controlled, according to the usual method, from the dry bulb temperature in the room, there may be a wide variation in this effective temperature due to the varying amounts of moisture in the air, unless humidifying apparatus with accurate humidity control is employed. Between the condition of absolute dry air at 70° and absolutely saturated air at 70°, there is a difference of 10 degrees in effective temperature which means an average difference of 25 per cent in the quality of ventilation. This may be taken to mean about 10 per cent on each side of the neutral point for ordinary ventilating conditions, so that the air washer and humidity should improve the ordinary ventilating plant another 10 per cent on this count. Good filters will of course serve the same purpose for cleaning the air of suspended matter, and may improve the ventilation about 10 per cent.

Relative Humidity. It should be noted, in connection with our present means of measuring and comparing qualities of ventilation, that we do not take into account any of the functions of the relative humidity of the air except that bearing upon effective temperature. This means that air of any temperature and relative humidity, within proper physical range, i.e., below 64° wet bulb, may be made to meet the comfort line by either heating or cooling without addition or deduction of moisture. Absolutely dry air may be heated or cooled to 78° and be 100 per cent as far as effective temperature is concerned, and still be far from perfect as far as effects on the membranes of nose, throat and lungs are concerned. Such dry air is also very conducive to the increase of dust in the atmosphere of a room from the standpoints of dryness and electro-static agitation. The air washer and humidifier correct these difficulties, and there should be some definition of limits for the relative humidity in our measure of ventilation.

Eliminating Dust. It is not unusual to find from one to two million particles of dust per cubic foot in the outside air surrounding city buildings, and unless this is eliminated it will give dust counts in rooms equivalent to a deduction of from 5 to 20 per cent in the perfection of ventilation. A good air washer should eliminate from 80 to 90 per cent of the dust entering the intake and perhaps reduce the dust penalty in the rooms to less than one-half of these figures. It will be seen, therefore, that air washing and humidification may improve the quality of ventilation about 10 per cent in the effective temperature department, plus another 10 per cent in the dust department, plus other improvements in the quality of ventilation by maintaining proper humidity and removing injurious substances and odors.

ARCHITECTURAL LAW

THE DWELLINGS LAW

BY

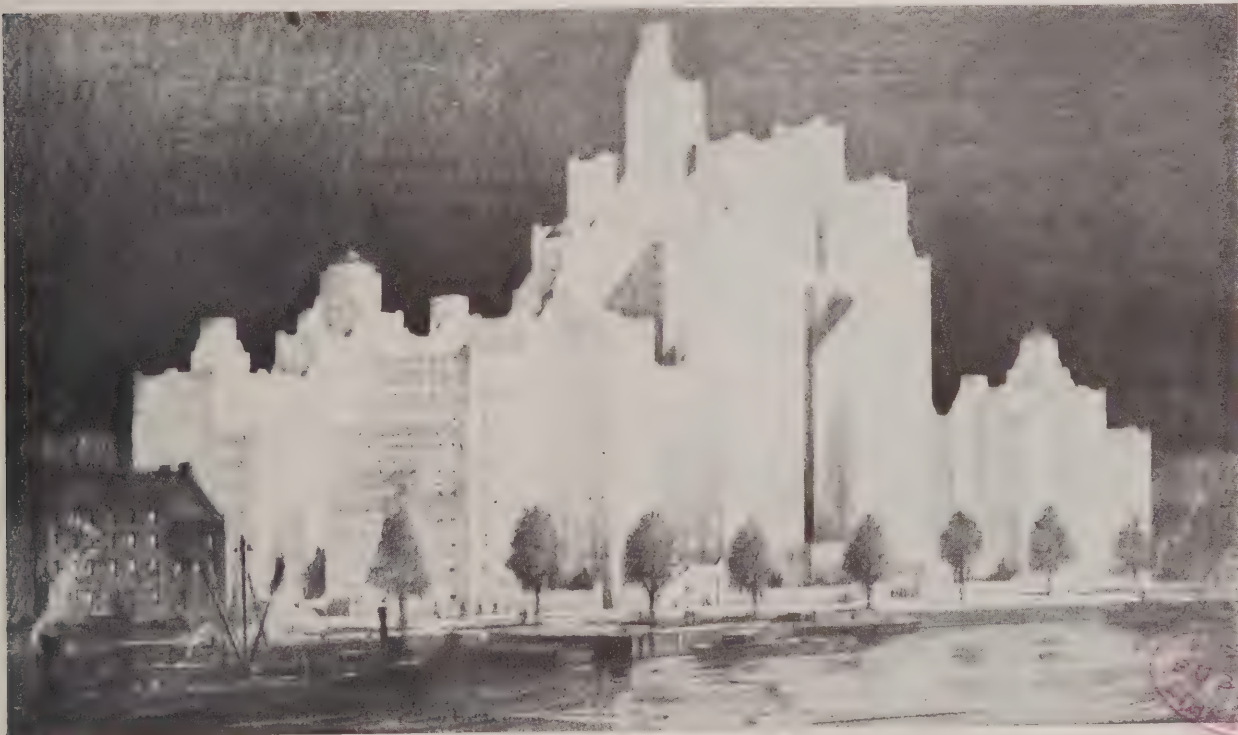
JOHN TAYLOR BOYD, JR.

RARELY has an item of legislation so interested New York architects as the proposed "Dwellings Law," which was submitted to the legislature last winter by the "Temporary Commission to Examine and Revise the Tenement House Law." The Real Estate Board of New York requested the appointment of this Commission for the purpose of making changes in the existing tenement house bill, which applies to the design, construction and maintenance of apartment houses in New York and in Buffalo. The request was worthy, for there can be no question that the existing law is obsolete in many provisions, and that it imposes unreasonable and costly penalties on design and construction.

So a new standard was demanded. Should it be a higher or a lower standard? That is the question. "We want a higher standard in some respects," said the Real Estate Board in effect, in its detailed recommendations to the Commission. "But," said the Real Estate Board, and here there was raised a large issue, "we want the privileges of building a greater bulk of structure on a given site, up to the limits permitted by the local zoning regulations which allow greater bulk for business structures, hotels, apartment hotels and institutional buildings, than does the tenement house act in the case of apartments." In other words, the real estate organization

demanded lower standards of light and air, although generally it favored adequate protection of sanitation and fire safety. But the Commission thought otherwise. In its proposed law the Commission stood squarely for somewhat higher standards of light and air than those in the existing tenement house bill. It went further. In order to protect the light and air of the individual property owner from the blanketing effect of tall non-apartment structures, the Commission greatly broadened the scope of the law. It included within its jurisdiction hotels, lodging houses, boarding houses, boarding schools, furnished room houses, lodgings, club houses and college and school dormitories, as being multiple dwellings, designating them as "Class B." "Class A" designation means multiple dwellings of the apartment class and includes apartment hotels. By this means, practically all structures that are likely to be erected in a residential district are brought under the same regulations governing height and bulk, thus enforcing a more orderly arrangement of buildings and blocks and preventing blanketing light and air.

The Commission went still further. It enforced certain requirements of plan arrangement, sanitation and fire safety for dwellings likely to be converted in the future for multiple occupancy, in order that undesirable building may not result; and it also en-

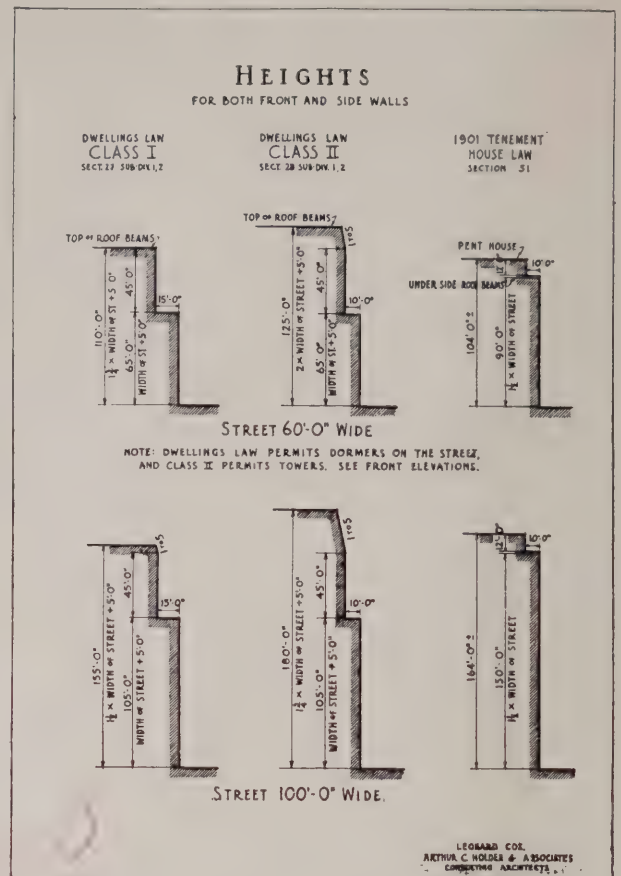


Possible Low Rental Development of City Block Under Proposed Dwellings Law

Arthur C. Holden & Associates, Architects

forced additional requirements of fire safety and sanitation on tenement houses erected prior to 1901, which have proved veritable fire traps and dangerous sources of infectious diseases. It also enforced higher standards on houses already "converted" illegally which had escaped the administration of the tenement house law, and of which the Commission says that some 30,000 cases exist. These requirements are chiefly matters of alteration and repairs. They are very important, however, as will be realized from a detailed reading of the law.

It is the new standards set for new multiple dwellings that are of the greatest interest for architects. Here the new law goes well ahead in the prescription of an improved type of apartment house. The net rentable area permitted under the Dwellings Law appears to be about the same, or even a little greater than under present practice, as indicated by the table of comparative floor areas under the existing law and under the proposed measure, and by several typical floor plans of apartment houses. This is part of the work of the consulting architect of the Commission, Leonard Cox, of Arthur C. Holden and Associates. But, although the volume of building is roughly identical, a new shape of building is required. Larger courts and rear yards are necessary;—on the street fronts the cornices must be dropped about 30 per cent lower than at present, and on all four sides, if the building is to rise higher, there must be setbacks until the maximum height limit is reached. This maximum height is raised above the limit of the existing tenement house law, thus giving back to the property owner the bulk taken away from him in the lower stories of his building. This is the great advance in standards made by the law. It brings us nearer the ultimate goal of the free-standing city building, which is essential for the skyscraper. On page 27 of its report, the Commission says that "the ideal condition (for light and air) involves a spacing between structures equal to twice their average height." The lower of the standards prescribed in the law shows, as the result of scientific candlepower measurement, 50 per cent more daylight and 20 per cent more sunlight than under the existing law's minimum standard. Judged by this criterion, the advance can be carried much further before a wholly satisfactory condition is reached. But, judged purely architecturally, the advance is greater than that. In the lower stories the skyscraper is partly disengaged from its neighbors along the lot lines, through larger court requirements,—something the Commission was very particular about,—but even more important, the buildings are completely disengaged beginning at a height approximately above the sixth story. "Dormers" are permitted on the street front, much as in the New York zoning regulation. In addition, a tower, covering no more than 20 per cent of the area of the site, where the plottage is 2,500 square feet or more, may be built up to an indefinite height under certain circumstances. The operation will be seen in the diagram, and one is referred to THE FORUM

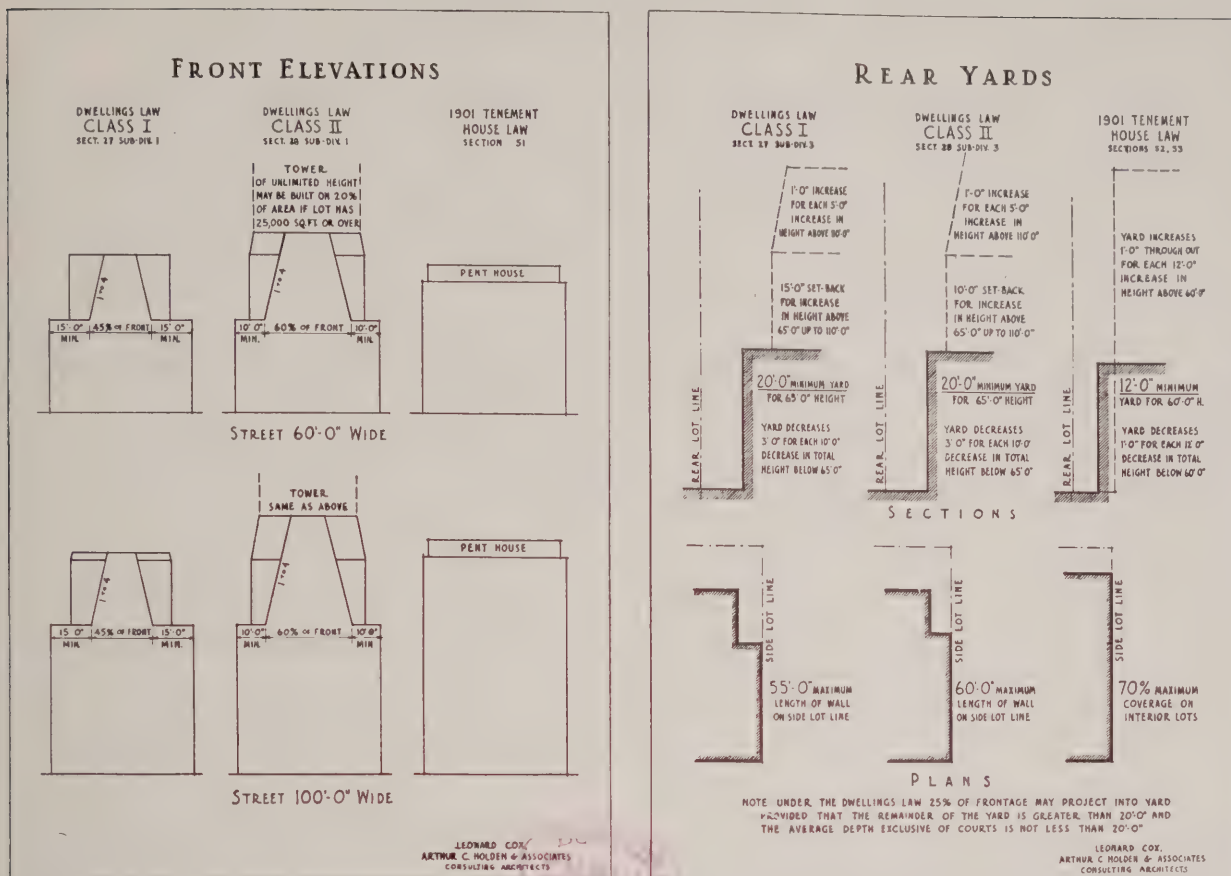


Heights and Setbacks for Front and Side walls

for February, to the article on "Architectural Law."

The purpose of the lower cornice heights, larger courts and yards and the pyramidal setbacks is to admit more daylight into the lower stories of the city block. In the individual structure, a much larger proportion of rooms will be arranged two deep, and the setbacks will facilitate the planning of single apartments with two or three exposures and terrace spaces. Quarters will be more like homes, with some of the amenities which make life decent. Architects will certainly approve of this standard, and will view with favor the appearance of the new type of city building which it introduces. They will see that it brings architecture back into city buildings and makes for order and an orderly city, as Harvey Wiley Corbett has well said. Under present conditions, skyscrapers,—yes, and lower buildings,—are jammed together, usually on undersized or ill-shaped plots, the buildings themselves distorted, box-like, ugly. The result is bound to be low-standard, no matter what the architect's ability. What has become of architecture as an art of three dimensions? There is no real planning but merely a skillful piecing together of a few standard parts and details. Homes have no character, and all look as much alike as rooms in a hotel. The people who must live in these abortions are getting well fed up with them.

As regards elevations of the typical New York apartment, what more favorable can be said? Eleva-



Possible Front Elevations and Rear Yards Under Proposed Dwelling Law and Under 1901 Tenement House Law

tion as an integral part of a mass,—which is the essence of architecture,—is nowhere to be seen, unless in a few exceptionally well situated buildings. The architect is a mere surface decorator,—as the engineer has at times unkindly called him,—a beauty specialist, who “lifts” the faces of buildings. Where are there any signs of beauty on Park Avenue, with its miles of solid walls of *casernes*? Billions of dollars’ worth of buildings in New York, built from acres of blue prints skillfully contrived, but scarce a cent’s worth of architecture! The Dwellings Law should abolish this unhappy practice, from which, in the long run, nobody gains.

But the most novel feature of the new law is the introduction of the principle of adjusting standards of light and air according to land values. Greater bulk, i. e., lower standards of light and air, are allowed on practically all of Manhattan Island, and on a very small portion of the area of Brooklyn which amounts nevertheless to about half the area of Manhattan. The exact working of this double standard should be clearly understood. The Dwellings Law requires that all new multiple residence structures built on sites, the assessed value of which, exclusive of the buildings thereon, is not more than \$2 per square foot, be deemed “Class I” buildings, and that those where the assessed value of the site is higher be “Class II,” as explained in the Commission’s report. Class I structures are restricted to a

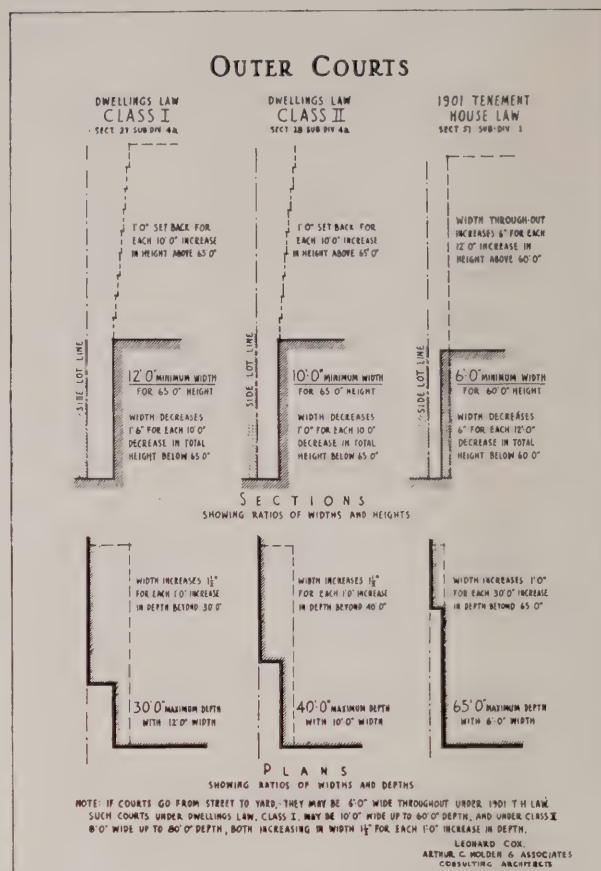
lower height and smaller area than are Class II, and they do not all enjoy the tower privilege allowed in Class I for plots of 2,800 square feet or larger. This distinction does not mean that \$2 per square foot is a theoretical dividing line for a change in standards of bulk. It is more practical than that. It means that the Commission mapped out the “unspoiled” areas of Greater New York and then took this figure as a formula which best fitted actual conditions. The outstanding fact is that throughout the Class I areas there are practically no buildings which are built up to anything like the bulk permitted for Class I. In Brooklyn, for example, practically all existing buildings in Class I area are less than five stories high. There is thus ample opportunity under the law for larger buildings and consequent increased land values in Class I area. The differences between Class I and Class II requirements are seen in these illustrations.

Another excellent feature of the Commission’s work was the enforcing of better conditions along side lot lines. This is a further step toward the ideal of separation of adjoining buildings, which has become essential in the modern city because of the introduction of the skyscraper and the increase of traffic in the streets. Indeed, in these many provisions governing bulk, mass and planning, may one not conclude that here is an almost new type of law governing buildings? It is an architectural law, instead of a construction or sanitary law, a *plan* law,

as distinct from the usual *specification* law which the average building code is;—is this not significant? To be sure, building codes and zoning laws have provisions governing plan, and this Dwellings Law, as well as its progenitor, the existing tenement house law of 1901, contains provisions requiring standards of sanitation and of fire safety. But the distinction seems sound. Its introduction is significant today, when every evidence points to a growing public demand for a more scientific coördination of buildings, one with another, and with the city plan.

One other important provision of the law deserves the sympathy of architects. That is in the further restrictions which are placed on the narrow lot of about 25 feet frontage, making more difficult its use for a skyscraper. The existing tenement house law legislated indirectly against the narrow lot to such an extent that in Manhattan and the Bronx it generally forced the abandonment of the 25-foot lot for five- and six-story tenements, at first to the despair of builders, but afterwards to their satisfaction, because they now use wide frontages, 100 feet or more, for either skyscrapers or "walk-ups." But in Brooklyn, multi-family dwellings are still built on narrow plots. On the whole, it is just as unreasonable to ask that a tall building be allowed on a narrow lot as that an automobile be run on the sidewalk!

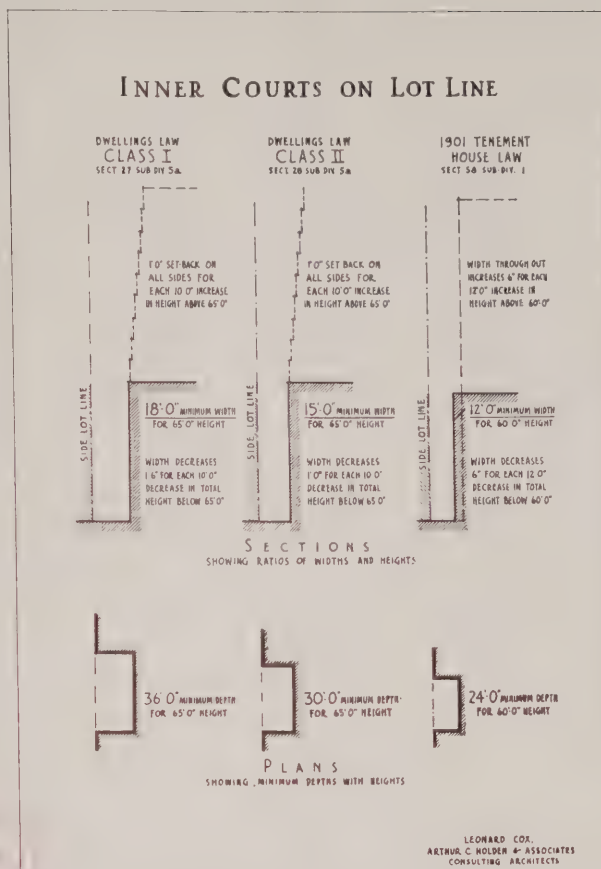
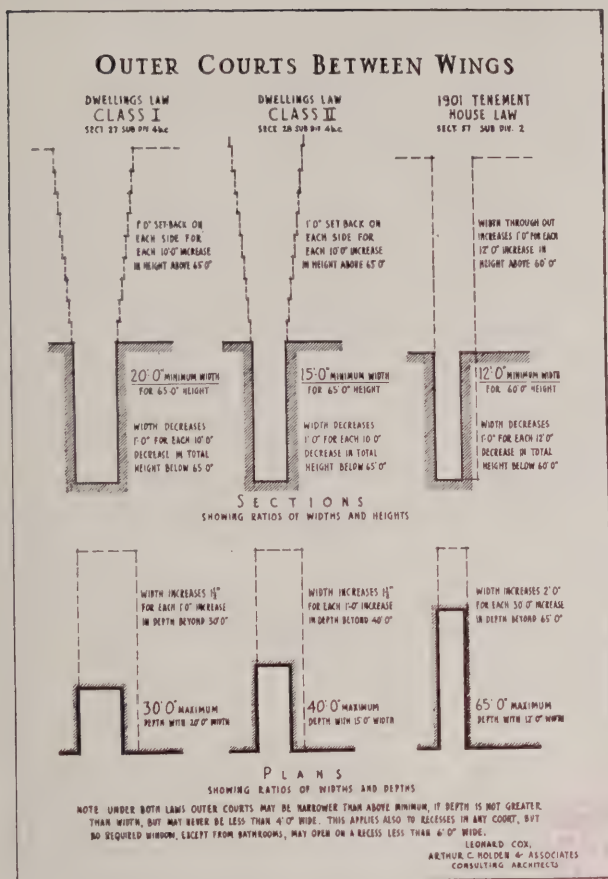
Again, let it be remembered that all these questions are fundamentally those of light and air. "Shall I develop my property at my own expense, or shall I contrive it so that I can force my neighbors to pay for it?" In England there is the law of "ancient lights" which protects a property owner in his rights to light and air, and it is said that portions of Westminster Abbey had to be set back in order to maintain the neighbors' rights. Would that a similar law could have been invoked in the United States when the skyscraper appeared! Then we should have seen this wonderful modern invention of the architect used as a blessing and not as an apple of discord! In New York, as already suggested, no one can be found to admit that he disbelieves in light and air. In fact, the tendency of both real estate promoters and of tenants is increasingly in the other direction. The difference is that the tenants are more willing to pay for it themselves. The real estate promoters, on the other hand, have engaged in a scramble for special sites where, paradoxically, the other fellow pays the bill. There are plots which are situated on street corners, or opposite parks or beside low buildings of a fairly permanent character, such as single-family houses, public structures, schools, churches, etc. But, as more and more skyscrapers appear, the number of these strategic sites grows smaller. There is increasing danger for the man who blankets his neighbor's property that his own building in turn may be blanketed or closed in. The opponents of the Dwellings Law, in alleging cases (in which they were rarely sustained) of hardships created by the new law, appeared to forget that the existing law creates infinitely more cases of damage to property.



Possible Dimensions of Outer Courts Under Proposed Law and Under Existing Law

Furthermore, the existing law was originally designed to apply to "walk-up" tenements, at a time before the skyscraper problem became acute, and consequently the coverage and court sizes prescribing for low buildings, none too sufficient light and air, are impossible for skyscrapers of from two to three times that height.

There are many other provisions in the law relating to new buildings which will repay study. Complex as it is, it is admirable in being written in every line under the supervision of an architect, in co-operation with the counsel of the Commission, Harold Riegelman. The consulting architect had the criticism of other architects and many experts. As a result, the bill is free from those grotesque provisions that are now and then found in building codes, and which indicate the hands of engineers who lack knowledge of planning. Also, the bill is purposely drawn to serve as a handy manual for architects, builders and owners, instead of being merely the usual catalog of "can do" and "cannot do," which wastes so much time on a drafting table. The provisions regarding sanitation and fire safety are worth study in themselves, in their application to both new and existing buildings. Interesting facts in this connection are that 60 per cent of fires in non-fireproof buildings originate below the second floors, and that the worst hazard is a non-fireproof stair. Particularly necessary is the requirement that



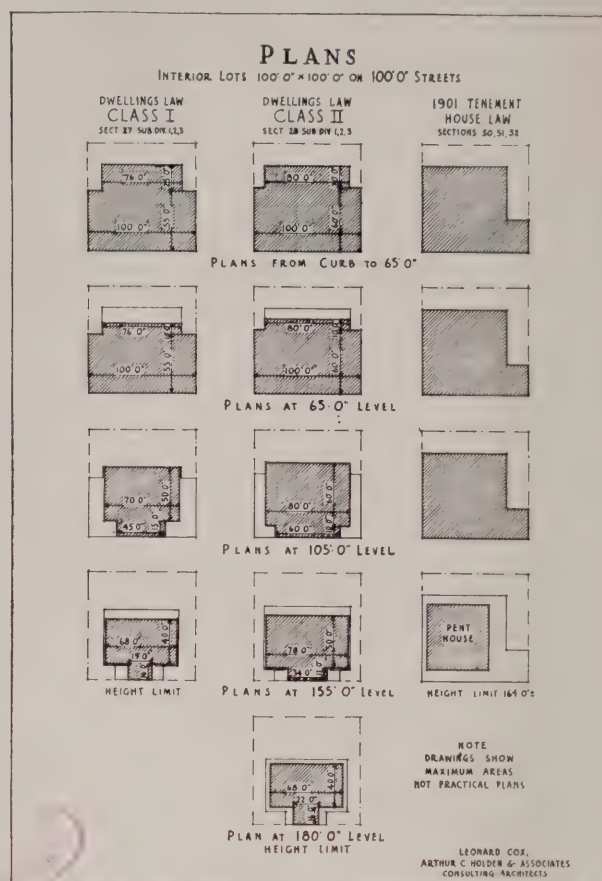
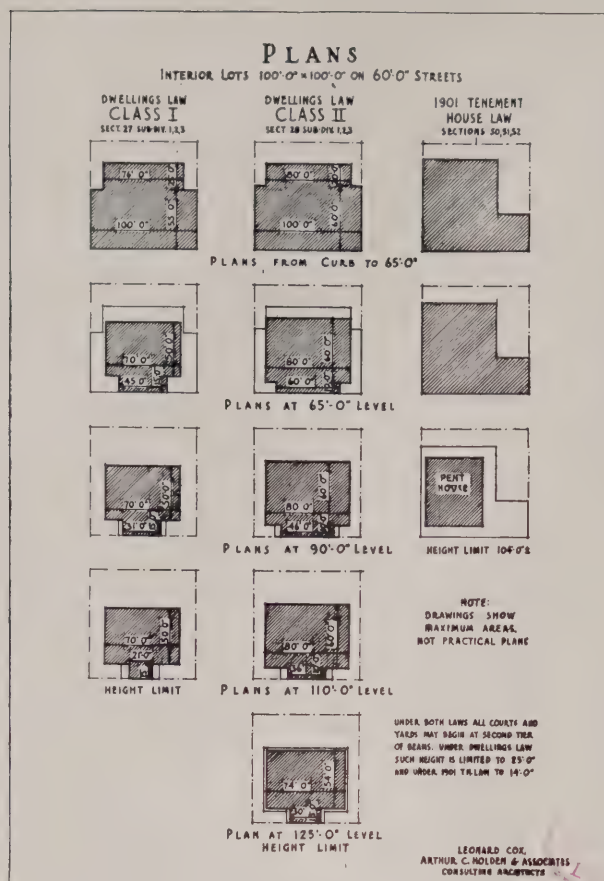
Comparison of Requirements in Regard to Sizes of Courts Demanded by Proposed and Existing Laws

frame buildings be spaced farther apart, about 12 feet as compared with the 4 to 6 feet permitted by the New York code. The result of this local practice has been to create huge areas of little frame dwellings, often of flimsy construction, equal in total area, it is said, to that of Chicago at the time of its great fire. This frame construction is located in the borough of Queens. In many cases it is without adequate fire protection, and is probably one of the worst fire hazards in the world, comparable only to Yokohama and Tokio before the recent fire and earthquake. The New York Chapter of the A. I. A. had previously publicly called the attention of the city authorities to this menace. The Mutual Association of Lumber Manufacturers approved the restriction on this hazard as preventing an illegitimate use of lumber. The underwriters also supported the law.

These portions of the law are important for architects, because in similar situations architects may find it difficult to gain the political support of other interests for improved standards for new buildings, unless they themselves are willing to take a stand in regard to structures already existing. One can readily see that such a law as the Dwellings Law, enforcing higher standards for nearly all classes of residence buildings, provoked certain real estate circles. These interests viewed the Commission as its own progeny and were shocked to find disobedience to their wishes. A small hornet's nest was stirred up,

and in the excitement it was even rumored that some architects thought they had been "stung." The result of the controversy at the time of writing is that the Commission will be continued for another year for the purpose of proving its case to the public. In nearly a hundred years of tenement house legislation in New York, no measure looking toward improvement has ever failed to be enacted. Nevertheless, the bearing of real estate opinion is important in evaluating an architectural law. In New York, the opposition developed from a small minority which had been guilty of violating or evading existing laws. Others had an interest in low standards, such as the frame construction fire hazard or ramshackle "old law" tenements. The latter were built prior to 1901, have paid for themselves, and should be scrapped.

The more powerful opposition to establishing improved standards is of a different type, coming from people holding a number of views. There are those who will not take time to examine the law carefully. Others want no change under any conditions, and object to the inconvenience of change. Judging from the approval of the new law given by a few prominent real estate men and builders, the Commission may expect to overcome this opposition in the course of a year. It should be able to prove to the more responsible real estate men that the law will give better protection to property than does the existing regulation. The Commission should be able to demon-



Maximum Plan Dimensions Allowed at Various Story Levels Under Proposed Dwellings Law and 1901 Tenement House Law

strate that not only is the rentable area of buildings as large under the Dwellings Law, but that this area has, in one way or another, greater rentability, since it is generally more desirable space, even in the lower stories. In addition, the Commission has simplified the intricate provisions of the existing tenement house bill relating to stairways, halls, elevator vestibules and other means of egress. These latter economies are appreciable, and they offset any slight increased cost of the stepbacks. Most of these minor improvements which relate to new buildings are heartily approved by real estate men and builders. These considerations, however, do not entirely explain the basis of the real estate attitude. The speculative foundation under so much real estate activity is, of course, the real reason for opposition to architectural laws enforcing higher standards. It is this speculative phase which works such injury to the building industry. Excessive speculation is obsolete today in most of the American industrial, business and financial world. The trend is all the other way,—toward a solid investment basis,—and it is doubtful how long real estate can lag behind.

At any rate, the havoc wrought in New York by low standards of development is terrific, if we are to believe the statement made to *The New York Times* by Thomas Adams, the well known city

planner and city borough director of the Regional Plan of New York and Environs. "It is giving people what they want that makes buildings profitable," said Mr. Adams. "The demand today, even among the comparatively poor, is for buildings that have light, air and good sanitary conditions." Then Mr. Adams referred to the startling fact that low standards were doubtless the chief reason for the exodus of New York's population to Westchester County on the north, to Nassau County on the east, and to New Jersey across the river. In Nassau and Westchester Counties "the increase in population was, during the five-year period previous to 1925, 34.6 per cent as against 4.5 per cent" in New York, or about 8 to 1. There is plenty of room left in New York where, as the Regional Plan had previously pointed out, about 90 per cent of the population lives in about 10 per cent of the area. This is the answer to those who defend congestion in the greatest and most congested city in the world!

The zoning resolution of 1916 has done practically nothing to relieve congestion in New York. One might even argue that zoning has increased it. The Dwellings Law is perhaps the first real step toward that end. Since, at the same time it establishes better living conditions and brings back architecture into city dwellings, the law is an aid to architecture.

BUSINESS AND FINANCE

THE ARCHITECT'S POSITION IN RELATION TO MORTGAGE FINANCING

PART I. IN THE FIELD OF DWELLING CONSTRUCTION

BY

C. STANLEY TAYLOR

Editor's Note. This is the first of several articles which will discuss mortgage financing for various types of buildings, and particularly the architect's functions and responsibilities in connection with this important phase of building. These articles will also set forth the general requirements on the part of mortgagees, which have been developed as a result of experience in this type of financing.

THE use of mortgage financing for residential projects of all types has become so general within the past few years that practically no dwelling is built without the provision of a large proportion of the necessary funds through such channels. In fact, it may be said that probably 75 per cent of the total amount expended for new dwelling construction is originally derived from mortgage sources of various types. This includes, of course, first and second mortgages, or, as the terms are often used today, "senior" and "junior" financing.

For a great many years mortgage financing in the residential field was somewhat haphazard in its nature, mortgages being obtained usually from individuals or from savings banks, estates or institutions. The last two decades, however, have seen a sound and scientific development of this function of mortgage financing for residences. There have been established, often with very rapid growth, banking institutions having as their sole function the provision of mortgage money for the residential field. These include not only building and loan associations, but divisions or offshoots of title guarantee or trust companies and also real estate bond houses whose function it is to secure money from the public for use in this manner. The older types of mortgage sources, such as savings banks and insurance companies, have developed their departments to such a degree that in some cases a great many million dollars are loaned annually by individual organizations. In addition to these large individual loaning sources, we find that the organizations which specialize in building and permanent loans for residences have grown in some cases to such sizes that thousands of homes are financed annually through individual companies. As might be expected, this tremendous extension of mortgage financing has brought with it exhaustive economic study on the part of those who are interested in the subject, and particularly by those who are investing their money in this manner.

Before going into this phase of the subject, it might be well to deviate for a moment in order to describe briefly the more or less standardized existing sources and methods through which money is obtained for the purpose of financing residential construction. The various forms in which senior or first mortgage financing is obtained include straight building and permanent loans, which are placed on

the property for a definite period of years, usually three or five, and the amortizing type of first mortgage which is reduced periodically until it is paid off or replaced by a straight loan. The most usual form of amortizing first mortgages is typified by the financing which is provided through building and loan associations. As a general rule, the owner of the house pays 1 per cent of the face value of the loan each month. By doing this, the interest and principal of the mortgage are completely paid in approximately eleven years and seven months. Other types of amortizing mortgages have no standard rate of payment, but are simply developed through individual agreements between owners and mortgage sources, and can be arranged to meet the owners' personal financial situations.

The junior financing or second mortgage phase of a home-building operation is usually developed in one of three ways: (1) by a direct second mortgage loan, established for a given period of years (usually expiring when the first mortgage does); (2) by a second mortgage, provided through an arrangement with the building contractor; or (3) as is often done, when part or the whole of the purchase price of the land is subordinated to the first mortgage and takes the form of a second mortgage. Most second mortgages are today placed on an amortizing basis to be reduced by easy payments over a period of a few years. This entire junior financing market is entirely disorganized, or it might be more correct to say that it has never been organized. For some reason it has received practically none of the careful study which has been given to senior financing. As a result, the second mortgage field presents many dangerous factors. It abounds with evil practices in which shrewdness and unscrupulous manipulation in many instances threaten the home owner with direct loss of his money, if not of the property itself. Because there are no organized methods of second mortgage financing, and few if any recognized channels for the clean handling of this important phase, it is difficult to obtain junior financing except by the payment of high premiums, and there is also a constant traffic in the discounting of second mortgages, which as a rule the contractor or the speculative builder figures in as part of the cost in the building of homes.

The customary sources through which first mortgage money for home-building is obtained include primarily savings banks, insurance companies, title guarantee companies, trust companies, real estate loaning institutions, estates, and individuals. The amortizing type of first mortgage is primarily obtained from building and loan associations which function also as savings banks for prospective home-

builders who wish to accumulate part of the necessary investment before actually beginning building operations. Some of the real estate loaning institutions offer various types of amortizing first mortgages, and because of the amortization feature, it is usually possible to obtain a larger loan in proportion to the value of the property. With this general background in mind, it soon becomes apparent that the more scientifically mortgage financing is administered in the residential field, the more important becomes the architect's relationship and his responsibility. Many of the established loaning institutions or sources have come to realize that they must to a considerable degree control both the *quality* and the *design* of the buildings which are to become collateral for mortgage loans. The customary first mortgage loan is approximately 60 per cent of the appraised value of land and building, while through second mortgage channels from 15 per cent to 20 per cent more of the cost may be borrowed. Thus if a project carries both a first and a second mortgage, the owner as a rule will have only 25 per cent or less of the cost as his immediate equity.

Obviously, it is really the loaning institution which pays the bills for materials and labor, for architects' fees and contractors' profits. It is but natural, therefore, that many of the loaning institutions have developed departments or employed supervising architects to check carefully the plans and specifications submitted in connection with mortgage applications. Here is where the architect of the individual project enters very importantly into the financing picture. If his plans are efficient in character, representing sound, economical construction methods, and if his specifications present a selection of materials which seem to insure permanency and low maintenance cost, it is quite apparent that when the mortgage company makes an appraisal, the home owner will receive much more favorable financial consideration and will be able to carry out his project with a smaller cash investment. An examination of the records of mortgage companies will show a great many instances where mortgage loans have been refused because plans were impractical or specifications were not drawn in a manner which would insure good construction. After all, the ultimate real estate valuation of a completed project and the likelihood of its maintaining a consistent, good market value must be highly important from the point of view of those who provide mortgage money. Not only must the property hold its position in competition with other dwellings which may be offered for sale in the immediate neighborhood, but it must be of a character which is readily salable, so that it will not enter the so-called "white elephant" class of dwellings on which past experience has shown extensive losses, not only for owners but for mortgagees.

In designing dwellings for individual owners or for speculative builders, the architect in modern practice is usually called upon to have a clear under-

standing of mortgage financing methods and to assist the owner in obtaining favorable financing. In fact, in many instances today the architect performs the financing function and finds it to be a valuable part of his service. If he designs many houses, he soon becomes well known, at least to local loaning institutions. It is not an unusual experience to hear bankers make the statement that on houses designed by certain architects, they will readily give higher appraisals and make loans perhaps 10 per cent greater. This is because they know through experience that the particular architects in question plan efficiently and build well. In other words, they know how to create collateral better than the average. Most architects probably know by experience that the average home-building client is not familiar with mortgage sources or mortgage methods. As a result, the business aspect of many of these projects is not good as originally established by the home-builder. Often it turns out that the home-builder has not sufficient money to provide the necessary equity, and if the architect understands local mortgage financing, he may be able to rearrange the situation so that the project may proceed instead of being abandoned or held in abeyance until the owner finds himself better situated financially.

There are at least three ways in which the architect benefits directly through the development of knowledge of this kind. He gains an enviable prestige, not only with financing institutions but in real estate and local home-building circles, so that such knowledge often brings in commissions which he would not otherwise obtain. He will find that local real estate operators and real estate brokers appreciate business-like administration on the part of the architect, and that they are much oftener ready to work with an architect who combines knowledge of both design and the business phase of a residential project than with one who must be constantly checked from this angle. It is also often the case that mortgage institutions will recommend architects because they have developed appreciation of the architects' business-like service as well as of their designing ability.

It should, of course, be apparent that no one expects the architect to have an intimate, detailed knowledge of mortgage rates, discounts, and the other technicalities of this type of financing. If he possesses such knowledge, it is of great value, but the type of knowledge and experience which is really desirable in this connection involves primarily technicalities of design and construction. In other words, the architect's function is to design a project in a manner which will be consistent with the requirements of those who are expected to loan money for the operation. For this reason, it may be of interest to review briefly some of these requirements as they have been expressed from time to time by those in charge of the appraisal or technical departments of loaning institutions.

When a mortgage application covering a home-

building project is brought to one of the modern types of mortgagees, the first consideration is usually given to the location of the property and the physical evaluation of the land. There are certain districts as affected by neighborhood conditions which are considered much more favorably by loaning institutions than others. The general environment is important; the trend of local development is considered; the existence of community facilities and mechanical improvements such as water, sewer, gas, electricity, etc., is thoroughly examined; the physical condition of the land is analyzed, together with local real estate valuations. In more than one instance architects have taken part in this and rendered important service to clients. Just because a client happens to own a given plot of land on which he intends to build a residence does not mean that he *should* build there. It may be that unfavorable local conditions exist or are developing. It may be that the location or the physical aspects of the particular plot are not suitable for the type of house which the client prefers. It is, therefore, quite possible that through the architect's suggestion a change of site may be found practical and desirable, and in this manner the project may be made much more readily subject to favorable mortgage financing.

The next consideration is given to the plans of the house. Here is where an extremely careful study is made primarily to eliminate two dangerous factors,—first, waste space which is uneconomical from the point of view of both owner and mortgagee, and, second, impractical building construction conditions as imposed by the plan. Here is where an architect has an opportunity to display both ingenuity and practical knowledge, because if the plan is efficient, a much more favorable appraisal will be rendered, and if it is not efficient, the mortgage application may be refused or the amount granted may be considerably less than the owner wishes to obtain. After the plans have been thoroughly analyzed, the element of design is given consideration, not from the æsthetic point of view but primarily from the *market* aspect. Is the house designed in such a manner that it will appeal to the type of prospective purchaser to whom it might ultimately be offered for sale? Is it designed in a manner suitable for its environment, and does the design offer a balanced ratio with probable construction costs? In other words, mortgage lenders realize that there may be waste or increased construction cost imposed not only in the plans of a house but also in its general design. If it is over-elaborate or if it calls for details which are inconsistently expensive, it will not make a favorable impression at the time when the loan is being considered.

After the plan and the general design have each received careful analysis, the next, and one of the most important considerations, is the question of specifications. Here as a rule the requirements of mortgage lenders are becoming constantly more stringent and more definite. The value of various

building materials and types of equipment is known today and can be measured accurately. Manufacturers have done much to educate not only architects, contractors and owners, but also those who are interested in loaning mortgage money as to the merits of various materials. The particular points of interest include permanency and low maintenance cost as primary factors. The dwelling that soon begins to require replacements and shows comparatively rapid deterioration naturally does not constitute good collateral for mortgage loans. The banker is interested in the owner's ability to pay his interest, his amortization payments, and ultimately the principal of the mortgage, and he knows that if a dwelling is costly from the maintenance and depreciation point of view, the owner is in a less favorable position to keep up his payments. He knows, too, that even the quality of appearances after a few years has much to do with the appraised value of the property, and if a dwelling begins to look shabby and to show the need of repairs, thousands of dollars may drop off its market value. For this reason, the architect's specifications are in most cases quite thoroughly analyzed before the mortgage loan is made, and while some lending institutions may take the trouble to suggest changes in plan and in specifications, many of them will simply turn down the application or offer a smaller amount of money without any special explanation of the reasons. Specifications are, of course, analyzed also from the point of view of construction cost. The materials and equipment used should in the main be consistent with the general cost of the house. It is, of course, permissible for the owner to exercise his own judgment in the use of comparatively luxurious appointments, but these will gain very little recognition in the general appraisal of the dwelling, except where they might be in the nature of unusually good mechanical equipment, which has a definite utility value and which might function as an additional factor of value in the ultimate sale of the property.

It must be quite apparent that the architect in his service exercises a very definite relationship with mortgage financing, because in practically each division of appraisal, his function has its place and his work will meet with approval or disapproval. It must be remembered also that in appraising the value of property, those who are making an analysis in the way described in this article must sum up the total favorable and unfavorable points in relation to the land and its treatment, the house and its design, the plans and the specifications. The final total sum of impressions and facts forms the basis of the appraisal itself, and there may be a variation of thousands of dollars between two dwellings of equal cubic footage. Making the most of this variation is the architect's responsibility, and it is for this reason that he should thoroughly understand how mortgage appraisals are made and should constantly think of this ultimate test when he is developing each part of a project.

THE BUILDING SITUATION

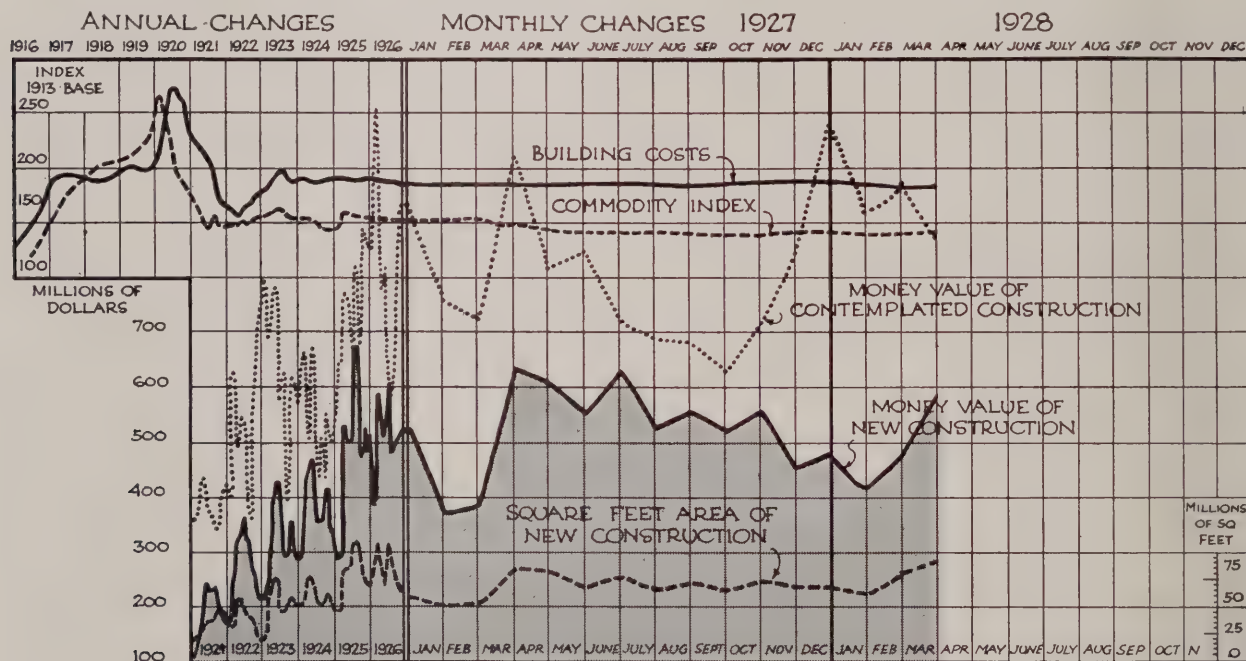
A MONTHLY REVIEW OF COSTS AND CONDITIONS

IN spite of many predictions to the contrary, construction activity for the year 1928 has opened in record-breaking volume which bids fair to continue for at least the first half of the year. According to figures of the F. W. Dodge Corporation covering the 37 states east of the Rocky Mountains, there were contracts let for new construction during the first quarter of this year to the amount of \$1,485,067,000, which is an increase of approximately 6 per cent over the amount of building started in the first quarter of the year 1927. This figure also represents the highest first quarter record ever established in the 37 Eastern states. A glance at the chart included here would indicate graphically the comparison of activity between this and other first quarters, and it becomes obvious that the year 1928 will add another record volume to the construction history of the last four years.

The new work contemplated, as indicated by plans filed, during the month of March, is considerably lower than the figure for March of 1927. The types of buildings for which plans have been filed are somewhat different and include a much larger number of institutional and commercial projects with a definite decrease in the amount of speculative building of both apartments and residences. On the other

hand, the amount of building by owners for their own occupancy in the residential field is evidently increasing this year as compared with the 1927 figures. Contracts let during March amounted to \$592,567,000, 46 per cent for residential buildings, 19 per cent for public works and utilities, 12 per cent for commercial buildings, and 6 per cent for educational projects.

Considering the plans which were filed for new construction in the month of March, as compared with March of 1927, we find these territorial changes which perhaps offer some basis for predicting trend of activity in the various districts. New York state and northern New Jersey show a 16 per cent gain in plans filed as compared with March, 1927. The New England States show an increase of 32 per cent; the Middle Atlantic States show a loss of 44 per cent; the Pittsburgh district shows a gain of 35 per cent over the contemplated record of March, 1927. In the Central Western States there is a loss of 44 per cent; in the Northwest a loss of 22 per cent; in the Southeastern States a drop of 54 per cent, and in Texas a drop of 35 per cent. It is probable that part of the unusual activity of the first quarter has been the result of an effort to let contracts early in order to partially avoid the usual spring buying activity.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs*. This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index*. Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction*. Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record*. (4) *Money Value of New Construction*. Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction*. The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

PLANNING GROUP HOUSES FOR RENT

BY

RICHARD H. MARR, ARCHITECT

WE have seen, illustrated in our professional journals, numberless fine examples of residence architecture,—in plan, with exterior and interior views,—permanent homes of happy and (occasionally, perhaps) satisfied owners. Why not attempt further to endow with the same taste and completeness the homes of the great number, who of necessity must rent? When we erect a building to rent we are in a position akin to that of a merchant investing in a stock of merchandise, for we must please the public fancy and also make profit in the transaction. The one great point of difference, however, is the fact that the merchant may vary his next order in whole or in part through his knowledge gained by the previous sale and owing to any change in the trend of public desire. The builder, however, must so present his merchandise of land, buildings, and equipment that it will meet with the approval of the clientele for which his building is designed, not only one year but for each year during the expected life of the structure. It is, of course, assumed that the responsibility of the builder is not to be transferred to some unfortunate investor after the first group has tenanted the building!

For the purpose of analyzing this problem, we might consider the most usual type of building investment,—that of multiple housing, and a more specific and not as widely treated subject, that of the semi-detached dwelling,—the suburban brother (or sister) of the urban apartment house. The particular group used to illustrate this text was not chosen because of merit in the solution of the problem, but because it represents the average solving of the prob-

lem facing the investment builder. The questions which the author attempts to answer are not indigenous to any special location. The problem of financing will not be touched upon except to say that buildings erected as outlined here will, perhaps, bear a closer investigation and warrant a more favorable loan than those in which these apparently obvious, but often neglected, points have been overlooked or treated in a careless manner. Principal and interest must be paid from earnings, which in turn come from satisfied occupants. The three main divisions in order of procedure are: (1) choice of location; (2) plan and arrangement; (3) material and equipment.

Choice of Location. As the buildings illustrated would cost approximately the same in any part of a given area suited to their clientele, it is evident that a good location will complete a good scheme, or a poor location make good buildings unrentable. Assuming that an approximate decision has been made on the total amount to be invested, and a portion allotted to the purchase of a site, these details should be considered:

(a) *Permanence.* Is the adjacent property of suitable character and likely to remain so?

(b) *Competition.* The site should be selected to give the group a decided advantage over any similar project that might be contemplated in the neighborhood. An effort should be made to obtain property facing a park or open space, or with a decided advantage in regard to view.

(c) *Accessibility.* The site must be chosen with due regard to transportation facilities, street car service



Group of Fourteen Semi-Detached Houses, Detroit

Richard H. Marr, Architect



The Garages are Grouped Together

and good roads, streets or boulevards for motorists.

(d) *Good address.* The appeal of a fine, accepted residence avenue has a decided advantage over a short, unimportant street.

Plan and Arrangement. The great amount of con-

temporary material made available through advertising in the architectural press should assist one in developing almost any given type of plan. Bear in mind, however, that too great a difference in rentals in the same building is not advisable. Do not attempt to get a few extra dollars by putting mediocre or small apartments adjacent to those for which a considerably larger rental is asked. There are several considerations in regard to plan that are very important. A plan should be as direct and simple as possible. This not only saves in construction costs, but usually improves both the appearance and the utility of the rooms. The shapes of the rooms should be considered very carefully to make sure there is available space for the usual furniture of the people to whom the house will be rented. Rugs come in various more or less standardized sizes and will not fit well in rooms of unusual proportions or odd shapes.

Windows should be so placed as to not only admit ample light and air, but to leave adequate wall spaces at the corners of the rooms for the placing of furniture. Weather-stripping of the windows is often a very desirable feature. Some operators have found that the use of glass admitting the ultra-violet rays of the sun is very desirable in sun-rooms or certain of the south rooms, if possible. It is well to consult the booklet of the United States Bureau of Standards in making the choice of such glass in order to make sure that the glass specified really admits enough ultra-violet light to be worth while. It is



Street Front of Group, Showing Variation in Exterior Design

naturally necessary to keep the service entrances well separated from the main entrances of the houses, and to make sure that the service entrance for one house does not come close to the main entrance of another. It is well to build in as few equipment cases, etc. as possible, except in the kitchen. The individual taste of tenants is too varied to make much built-in furniture usable, and the unused bookshelves of the tenant who has no books are depressing as well as useless. The planning and equipment of the kitchen constitute one of the greatest factors in renting houses, as the mistress of the menage usually scrutinizes this very carefully and is a competent judge of the working efficiency of the kitchen plan and arrangement. The provisions in regard to servants' rooms should be commensurate with the living standards of the tenants. One must consider, also, the paths of travel of servants in order to plan for their work with as little interruption or contact with the household as possible.

In group houses built for renting it may be economical to have a central heating plant for the group. However, if there is any likelihood of the houses being sold separately, it is well to provide a separate heating plant for each house. Garage space must be provided for each tenant, and it is sometimes well to provide an extra garage or two for the use of guests of the tenants or for the use of the tenant who uses two or more cars. In the case of an apartment that rents for \$300 or more a month, the family frequently needs space for two cars. On



An Attractive Entrance Motif

the general plan it is desirable to have a play yard or recreation space for young children, area well separated from the street in order to avoid accidents. Provision for the welfare of children is an important item in suburban groups of this kind. It is advisable



Excellence of Design Enhances Rental Values

to provide a play room in the basement of each house or over the garage. The newer types of heating plants and the cleaner fuels often make possible the use of the basement as a play or recreation room.

Materials and Equipment. The choice of the materials for the exterior should be made with due consideration of maintenance cost as well as of first cost. Choose, if possible, materials which will age gracefully and which are not drab in color. The attractiveness of the exterior is the first factor influencing the prospective tenant, and first impressions are very often lasting. By all means, avoid use of the theatrical and the sham. This does not mean that color should not be used. It should be, but used with taste and restraint to make the houses attractive.

The equipment of the building is most important. The innovations and so-called luxuries of five years ago have become the necessities of today. It is well to introduce as many modern notes (of tested merit) as the rental will allow, as these items are desirable from the renting agent's point of view. A list of such equipment to be considered and specified, if possible, should include:

Mechanical refrigeration.

Thermostatic heat control.

Provisions for mechanical equipment,—washers, mangle, dryer, etc.

Resilient floors in kitchens.

Dining alcove furniture.

Ironing board provisions.

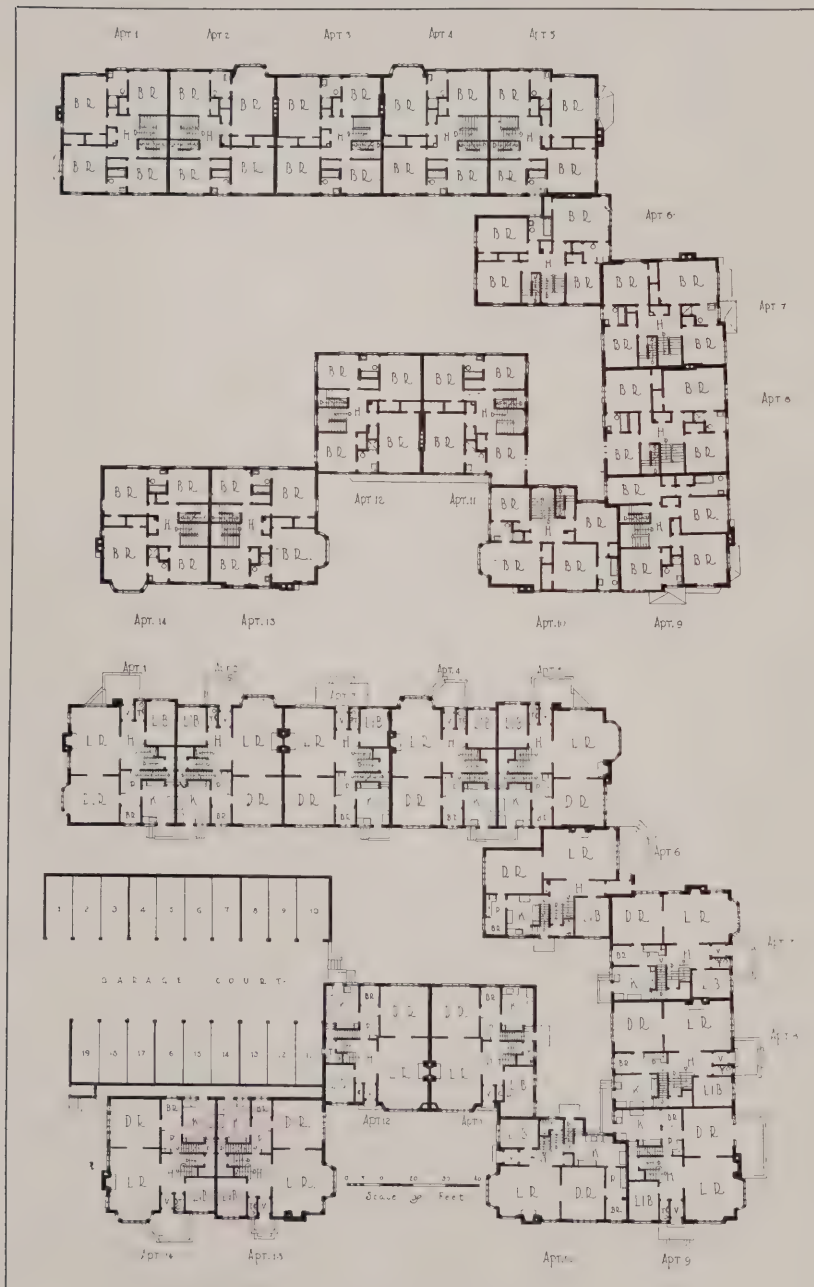
Built-in bathroom accessories.

Color in bathrooms,—tile and fixtures.

Cedar closets, etc., etc.

Ample electric outlets, including power outlets for cooking equipment, laundry equipment or electric heaters should be installed. Careful consideration must be given to the placing of base plugs to make them useful in connection with various arrangements of furniture. The wiring should be done with radio connections in mind. If these are provided in the initial wiring, unsightly and dangerous make-shifts will not be put up by the tenants. After all, this may seem to be a bromidic prescription, but it is the author's belief that a thorough study of the buildings most easily rentable and those most successfully operated will reveal the fact that most of the features enumerated here have been incorporated in the structures.

It is necessary for the architect to bear in mind constantly the desires and needs of the class of people who will be the tenants, rather than his own personal prejudices or desires. The owner of the development is usually informed in these matters, as he is in close touch with the local renting conditions and understands the requirements. The architect can fulfill these needs economically and efficiently and add his own good taste. He will always find that the requirements can be met without outraging good taste and good architectural design. It is his function to be the guide.



Plans of Group Illustrated
Richard H. Marr, Architect

THE ARCHITECT AS CONSTRUCTOR

BY

WILFRED W. BEACH, ARCHITECT

THE present building boom in our larger cities has brought such a satisfying amount of business into the offices of most of the country's architects that it seems quite unnecessary to even suggest a question as to what tomorrow may bring forth. Yet the "tomorrow" of architecture is what most interests the younger men in the profession. Is the architectural practice of the future to mean a continuation of methods now in vogue, or will it be vastly different? If different, wherein will lie the variation? Architecture and building are so fundamentally interlocked that it is quite obvious that a change of procedure in either calling is bound to affect the other. Hence a study of the evolution of either must, perforce, be accompanied by due consideration of the progress of the other.

When our nation was young, it harbored few architects; and still fewer of those who called themselves such were worthy of the appellation, as is amply evidenced by such of their drawings as are still in existence, notably those submitted in competition for the capitol at Washington. For many years, construction work of the young republic was handled by four classes of individuals: (1) the architect, *per se*, more or less as of today, but of a quite limited sphere; (2) the "surveyor," forerunner of the modern engineer; (3) the "undertaker," who bid upon and undertook the construction of the concepts of the two first named; and (4) lastly, the "architect and builder," generally a country carpenter, by whom was performed the major portion of the building of that day.

Some have described the present-day architect as an outgrowth, the fruit, so to speak, of this latter group, but that seems hardly fair,—true only to a very limited extent. Rather, we of today are really the logical successors to those pioneers who lighted the way with a few conspicuous monuments which still remain, speaking evidences of their truth and sincerity. The "architect and builder" was more than likely to drop the first part of his title, thus becoming the "general contractor" of our day. And how have we architects kept our heritage? We elders have seen architecture expand from a comparatively simple affair of foundations, walls, floors and roofs to the present highly involved creation involving a vast multitude of things, many of which were unknown even to our immediate predecessors. We readily accept as axiomatic the assertion that it is humanly impossible for any single one of the *genus homo* to completely master *all* the intricacies of a large modern building,—but does each of us go as far as he may?

Thirty-five years ago the architect was undisputed "boss of the works." Does he occupy the same pedestal today? Then, no building project of any

consequence, aside from the single item of bridges, was essayed until an architect had first been retained to design it and direct its construction. The complete architectural organization included men with sufficient knowledge of construction and the mechanical trades to design framing, heating, plumbing and wiring, in addition to the more æsthetic features of external appearance. But there came other architects, also of the first rank as to design and ethical status, whose practice did not warrant, or who did not choose to give, steady employment to men of exclusive engineering attainments. These architects found groups of engineers prepared to offer such service to all comers,—and the line of least resistance was readily pursued. Soon it came about that such engineering concerns were learning to solicit direct the designing of factories and warehouses, buildings which did not appear to demand embellishment,—"architecture," as by some considered. Next in the progression was the employment by such engineers of architectural designers, where these were demanded, to supply a needed touch to the otherwise simple mass. Whether the modern engineer has graduated from the ranks of the old time land surveyor and bridge designer or whether he is a direct offshoot of our own profession, makes little difference. He has become a powerful factor to be reckoned with in the acquisition of new business. To the small city practitioner this defection of industrial construction has not been of much moment. Whether such work be carried out by a distant city architect or engineering "specialist" worries him not at all,—it is not his funeral. Smaller fry "have smaller fleas to bite 'em."

For instance, there was a time when the stable "pot boiler" of the small office was the country home, costing from \$5,000 to \$10,000. The planning of these carried no direct profit,—even at a fee higher than the American Institute's minimum,—but they enabled the town architect to steady his small organization, and they increased the circle of his clientele. Much of this business has gone by the board with the inauguration of the Architects Small House Service Bureau. Presumably, this service has filled a "long felt want," so one must not quarrel with it. It merely takes its place with others among those things which have to do with the changes in office practice that have been and are still going on. True, the actual number of houses built from the Bureau's working drawings is probably proportionately small; but these drawings have furnished inspiration for countless others,—copies of which can be had at any lumber yard,—and which, by the way, are vast improvements over the comparative few that were in existence before an organization of architects added to the marketing of ready-made drawings and plans.

But the growth in the influence of the engineer and the influence of the ready-made plan on the volume of work in architects' offices pales to insignificance when compared with the steady advance into our field of the modern general contractor. This entity, formerly a willing and earnest bidder for the architect's favors and working under his supervision, has now become a most formidable rival in the securing of business direct from the owner; getting, in short, the planning of the work in order to be sure of getting its construction. Frank N. Watson, Secretary-manager of the Dallas Associated General Contractors, deals candidly with this situation. He speaks quite frankly of the demoralizing effect on building in general of the operations of the shyster and the novice in both architecture and contracting, and repeats the oft-reiterated complaint against awarding building construction by competitive bidding. He further says: "In too many instances, even the architect who appreciates his professional obligation permits himself to be over-ridden by the demands of the owner, and stands idle while the owner indulges in the common pastime of 'whip sawing' the three low contractors, or disregards his own interests by buying construction on price alone." This we all admit, and we also know to our sorrow that "entirely too many contractors, who make claim to skill, integrity and responsibility, are bidding for the profit instead of for the contract and are giving their 'subs' and 'dealers' the same or worse treatment than they complain of on the part of the owner and architect."

Well, why shouldn't they? If we consider only those offices which have never mistreated a contractor nor permitted a client to do so, can we find therein any fundamental reason that should lead a contractor to make a building better, simply for the love of that building? No, that is the sole privilege of the architect! The contractor is to make the building good because he is compelled to do so and for no other reason. In fact, he could not be depended upon to make it good without being hedged about with restrictions that prevent his doing otherwise. Such is the being created by our building contract. Nevertheless, our practice is so predicated on the custom of competitive-bidding contracting that we remain its sponsor and will probably continue to do so. We do not willingly try to educate the owner to other methods. We know full well that there are no ethical standards in such a game, and we write our specifications and contracts accordingly. Then, after the contracts are let, we accept the post of paid detectives and try to keep the contractor straight. Do we keep him so? Mr. Watson believes (and it is probably quite too true) that "any experienced contractor will admit that the leeway between good and bad afforded the contractor by the ordinary set of plans and specifications is not seriously impaired by architectural supervision; that the unscrupulous contractor, or even the ordinary honest contractor, faced with a possible loss through a price-competition, forced bid, can find many ways to skimp his work,

—giving construction that will pass the eye of the average inspector, but not giving the owner the quality he wants or thinks he is getting." This from the contractors themselves! But, suppose a builder of character and commensurate reputation has opportunity to serve a friend who wishes to build and wants him to do the work? "Even then," Mr. Watson complains, "by reason of the fact that our industry cherishes a taboo that design and construction are inviolably separate, the contractor must turn the prospective owner over to an architect who cherishes the same taboo, and the project usually ends in the same old free-for-all competition, and 'price' emerges the victor."

Discouraging this, for a builder who has the interest of a prospective client at heart and who steers him to a good architect. Why shouldn't he instead, if his initial hold on the owner be sufficiently strong, hire a good designer (away from some architect, if necessary) and execute the whole work as he knows it should be done and in a way that he and the owner may both take pride in? That's exactly what he's doing today,—and he's going to do it more and more often as the days go by. "Truth endures",—perhaps more fully in architecture than in some other fundamentals. Are we building with truth when we make use of unworthy vehicles, questionable materials and unrighteous intents? Competitive-bidding contracting is a relic of the day of *caveat emptor*. Why should the architectural profession collectively strive to maintain that iniquitous slogan when all the better class commercial world is seeking to place all business on a higher plane? Is it not natural for the business of building to follow suit, in spite of the architect? Then may we expect Mr. Watson's conclusion: "But, in the main, future construction work will be handled by firms which unite in one organization the functions now separately performed by architects or engineers and contractors."

Who may this entity of the future be, who is thus to combine the former distinct functions of architect and builder? Obviously, at the start, it is whoever first occupies the field. To an alarming extent, we find the contractor already there. But, is the field rightfully his? To a very large degree, his ability to sell his services in the dual capacity has been aided and abetted by a most powerful ally,—his willingness to finance, as well as to design and build the projected structure. It is in this line of endeavor that the large builder, operating his own architectural and engineering departments, has found the greenest pastures,—the ripest fields. Such a concern, functioning through a reciprocal agreement with a powerful bond house, wields a potential lever under that unassigned project. Even if the tradition be observed and an independent architect be favored, his retention is by sufferance of the builder, over whom he exercises no control whatever. If architects are to compete with this formidable protagonist, they must either equip themselves accordingly or find other points of advantage to aid them

in securing the business. It is very largely a selling proposition, pure and simple; a setting forth of the qualifications of the seller of services. To begin with, the architect finds himself possessed of one worth-while asset which connotes a corresponding weakness in the armor of his rival; he is a subscriber to a well defined code of ethics. No matter what one may think about this or that particular architect who is alleged to have side-stepped the code, the fact remains that the public has a sufficient respect for the standard of business dealings of the profession at large to hold such a transgressor to be an out-and-out crook, whereas a contractor may do those same things and worse, and be regarded merely as a shrewd business man.

Naturally, the architect's most ready entry into the construction field is by means of some form of cost-plus building. The solicitation of building construction without a guarantee of cost presupposes the highest type of salesmanship,—and architects pride themselves on being poor salesmen. They,—the best of them,—are sometimes heard to say that they never went out after a commission. Well, be that as it may, this article must be for those others who are willing and eager to expand; whose joy in the conception of an appropriate design can best be completed by the greater inspiration of the actual creation of the thing of materials enduring, that shall make the ideal real. Nor need such a one be deterred by Mr. Watson's showing of the scant profits in building construction. After saying that "statistics recently compiled from data in the Bureau of Internal Revenue show the average profit of general contractors to be only 2.1 per cent," he adds his impression that, if consideration were given also to those whose business was insufficient to demand a government return, "the 2.1 per cent is certainly 50 per cent high." That is, he thinks the average profit might be about 1.4 per cent.

But we need not reckon with these smaller fry, as they are proverbially poor business men, the majority being "carried" by the local lumber yards which reap the real profit, secure behind the mechanics' lien laws. Even the 2.1 per cent makes little if, as is generally figured, it depends on volume of business. A contractor with \$50,000 capital can readily handle \$2,000,000 worth of work a year, on which 2.1 per cent figures \$42,000,—not a bad return on the investment. But, in cost-plus building, where there are no losses to be charged off, and where the actual capital needed is proportionately less (say about 1 per cent of the gross business), the profits are, as for other forms of service, more of a return on energy expended than on actual financial investment. The building owner "carries" the operation. It is his deal, already financed. Why should he pay a high rate of interest on someone else's funds during construction, when his own have been set aside for the purpose,—are either idle or drawing a low return? If the builder is to have a hand in the financing, that is another matter. It then becomes a

subject of too many sides to be dealt with here and now. In any event, the financing should be segregated from the building construction and paid for as an independent factor; otherwise both may be found to be costing the owner inordinately.

One dispenses also with the incubus of fixed-price contracting, the 1½ per cent "thrown away" on a bond. As a matter of fact, an architect, upon first entering the building field, is more than astonished at the savings he can effect,—can turn back to the owner as part of the reduced cost of safe and sane building over that of cut-throat contracting. In a measure, the general contractor has "cooked his own goose" in the cost-plus game by the opprobrium brought upon it by his very lack of ethical procedure therein. Unless he can convince the owner that he himself is an exception (admitting that his competitors are not to be trusted), he must either be backed by the financial interests bonding the project or must have recourse to super-selling propaganda. In the last instance, he is likely to add a maximum guaranty to his offer,—and the owner is landed, tied up in a deal whereby the builder is both contractor and judge of what that contract is supposed to include, without price competition. This situation is always puzzling to an architect, who can with difficulty conceive how an astute business man can allow himself to be inveigled into such a palpable swindle. The answer is,—superior salesmanship. Nor is the salesman necessarily dishonest, though he may prove his employer to be. If the owner is so supremely foolish as to entrust cost-plus work to someone in whom he hasn't absolute confidence, perhaps he deserves to reap the proceeds of his own imbecility. *Caveat emptor!* And the warning is quite apropos in modern building, unless the prospective owner is careful to assign his work only to a firm of known integrity.

Let us cite, briefly, some actual instances. "A" was a banker who "fell for" the elaborate advertising of a concern grown plethoric with gain on such victims. The ordinary architect might not serve him, nor yet one extraordinary. He had so educated himself on biased propaganda as to believe he wanted a single entity to take all the building worry off his hands down to the inkstands on the counters. He couldn't see that that was exactly what any dependable architect would prefer to do, if permitted. But he got what he wanted, *plus*. The contractors were to get "cost, plus 10 per cent, not to exceed \$67,500," and made much of an assertion that they had once turned back over \$3,000 under such a contract. When this project was finished and the banker demanded a statement, all he received was that of a "certified accountant" to the effect that, inasmuch as the guaranteed maximum did not allow the builders the 10 per cent to which they would otherwise have been entitled, no further statement was necessary,—and none was forthcoming. Referring to his contract, the banker found that it called for "a statement," but that nothing was said about its being detailed or itemized.

That the building could have been reproduced for less than \$40,000 was amply proved by the experience of "B," another banker in the same town who built a year later, in the same block with "A." Costs were slightly higher; his building was exactly half as large as that of "A." The same builders offered the same kind of contract, with a guaranty not to exceed \$36,000. But "B" didn't think that "A" had fared any too well, and he looked up an architect who wanted the work, but wouldn't solicit it, wouldn't cut his price below the American Institute rate, and wouldn't guarantee the cost,—“quite evidently a poor business-getter.” This architect had planned other banks of the sort and had the best of references, as the banker's investigation proved. He thought the building could be produced for under \$22,000, and submitted an itemized estimate in support of his theory. The owner employed him, and the work which the architect had estimated at \$22,000 was executed for under \$21,000, and is at least 25 per cent better than that in "A's" building.

"C" was a banker in a distant city, solicited by the same concern that had built for "A." But "C" was a perspicacious individual, who could at least see through ordinary glasses. Marvelous salesmanship and extravagant advertising fell upon barren soil. He sought an architect experienced in bank work and discovered one with a construction division in his organization. But, when that architect said "cost-plus," he found he was "waving a red flag at a bull."

The memory of much ill-used privilege, which had masqueraded under that title, was fresh in the mind of the wide-awake Mr. "C." However, after thoroughly investigating this architect's past performances, he employed him for architectural services only, freely asserting that "no cost-plus-everything-else-possible builder would get a chance to stick a harpoon into him and twist it." But his troubles were not so easily disposed of. His appropriation was \$60,000, and his architect's estimate was \$65,000. Bids, solicited by the cautious banker, elicited a minimum of \$66,000 for the general contract alone. Impasse! There remained the heating, plumbing, wiring, bank fixtures, marble work, vault equipment decorating and numerous other *et ceteras*, for all of which the architect thought an additional \$25,000 or \$30,000 would be required. After several weeks of hesitancy, during which prices were steadily trending upward, the unfortunate banker allowed his need to over-rule his better judgment, closed his eyes and signed, "on the dotted line," a wide open contract, whereby his architect was to deliver the building which he had planned, and would be paid "cost, plus a lump sum." The portion of the work, for which the low bidder had demanded \$66,000, was done for under \$40,000, and the entire building turned over complete, within the estimated total cost. These are isolated instances, cited to prove nothing, but rather to indicate that an architect need not be timid about entering the practical building field.



Model of the Civic Center and Municipal Building, Denver
Allied Architects Association of Denver, Architects

OFFICE PRACTICE

THE ALLIED ARCHITECTS ASSOCIATION OF DENVER

BY

ROBERT K. FULLER, PRESIDENT

TO complete plans for the development of Denver's civic center and to provide architectural service for the proposed municipal building of Denver, were the principal objects which led to the formation of the Allied Architects Association of Denver. It seemed appropriate and feasible that this service be undertaken as a civic enterprise by the Institute architects of Denver because of widespread interest among members of the profession. The project contemplated by the city involved the expenditure of \$5,000,000 for the proposed municipal building, and the erection of this structure will form the major development of the civic center. The importance and responsibility of the architectural service necessarily required a high standard of excellence.

After careful investigation, the Colorado Chapter, which sponsored the enterprise, became satisfied that a properly organized association of architects could render the service required. Such an organization would permit of the selection and functioning of specialized groups, directing respectively the problems in plan and design, construction and engineering, and construction supervision. The proposal of the architects was received with favor by the city of Denver, and as a consequence the Allied Architects Association of Denver was employed by the city to render the service proposed. The membership of the Association includes all Denver members of the Colorado Chapter of the American Institute. The Association functions as a coöperative organization, incorporated under the state laws, and is governed by a board of seven directors. To render the service for the municipal building, a separate office organization was set up, and it has functioned similarly to that of any large firm of architects. Problems arising in plan and design, in construction engineering, and in construction supervision are reviewed by the respective committees on these subjects. The active direction, control and responsibility of the organization rest with the board of directors, to which all committees report. A member of the Association may enter the drafting room, if the need of such employment arises, but upon entering the drafting room his status becomes that of an employe only. Members are privileged, and were required at the beginning of operations, to submit preliminary sketches for the design of the building, and from this procedure much valuable information was procured for the later development of the scheme.

The work of the Association has proved of great interest to the members, and the coöperative character of the service has insured unity and harmony

in the affairs of the Association. The working drawings and specifications have been fully completed and have received the official approval of the Denver Art Commission, the Mayor and the City Council of Denver. The Supreme Court of Colorado has recently rendered a decision clarifying certain phases of legal procedure in the awarding of contracts, and it is now contemplated by the city that the actual work of construction on the municipal building shall begin within the next few months. The construction of the building will probably require three or four years' time, and when the service is completed the principal object of the association of architects will have been accomplished, and it will then in all probability disband.

The Allied Architects Association of Denver is committed to these principles of operation, which make it unlike other associations and which may be briefly summarized as:

1. Dealing with a single work,—a civic center and municipal building.
2. The adoption of a policy of non-interference with the private practices of its members.
3. Carrying out an enterprise undertaken by the profession in the interest of civic responsibility by the Institute architects of Denver, sponsored by the Colorado Chapter of the Institute.
4. The purpose of the Association to conserve profits, in order that, upon completion of the work, such funds may be administered for the benefit of the profession in Colorado.

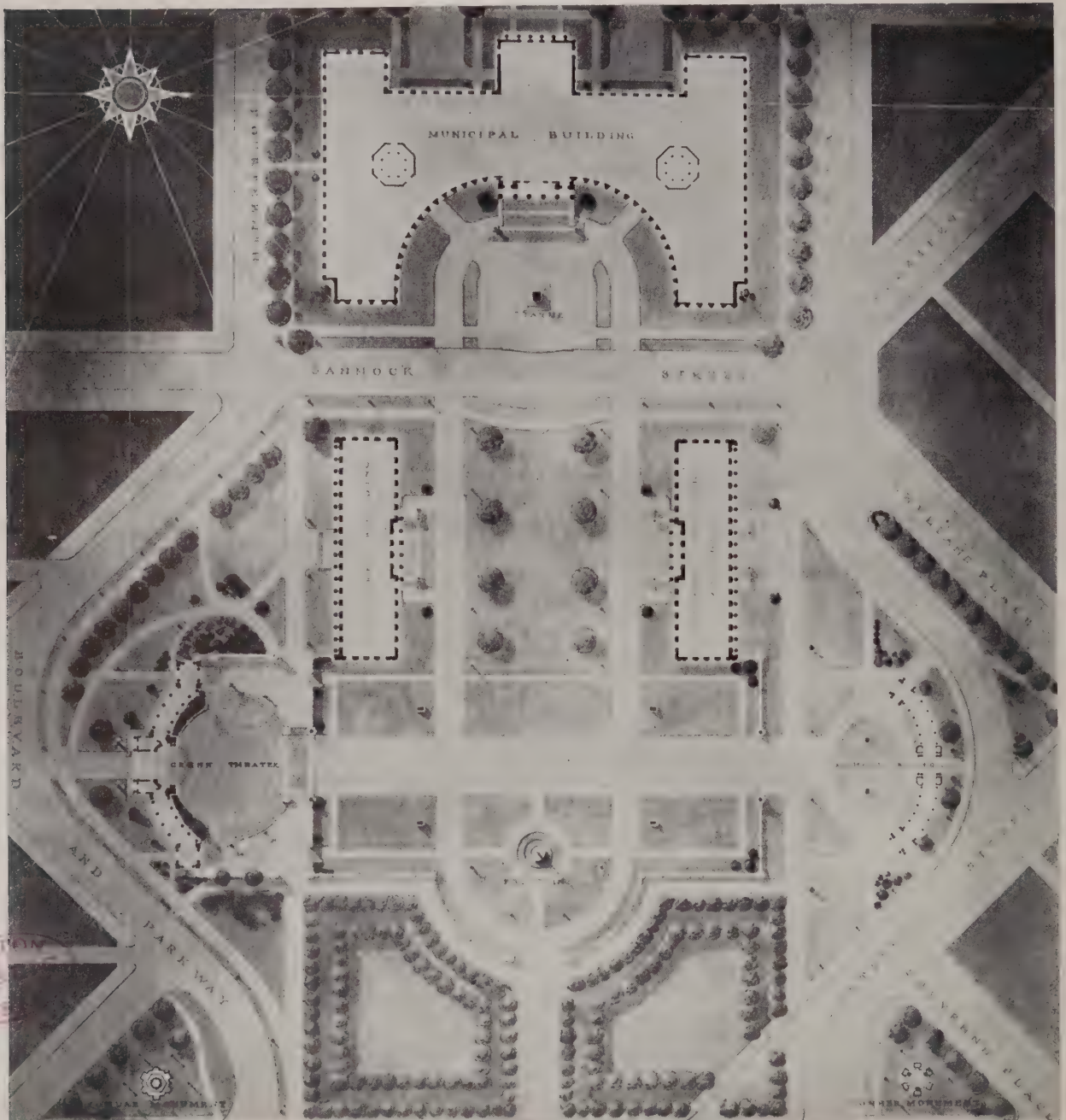
The success of the Association in its work may be attributed to these dominant characteristics:

1. The urge of civic responsibility accepted by the architects.
2. A service well coördinated and fully representative of the Institute architects of Denver.
3. The altruistic purpose concerning disposition of accrued profits.

Enduring benefits have already been attained in the profession from the unifying influence of a constructive work undertaken for Denver by the members of the Association. As a consequence, the Chapter's prestige has been elevated to new significance in municipal and state affairs. In recognition of this influence, members of the Institute are now serving on the State Examining Board of Architects, the Colorado Engineering Council, the Denver Art Commission, the City Zoning Commission, and the Denver Smoke Commission, in addition to having active representation in the Chamber of Commerce, the City Club, and various other civic organizations.



ELEVATION, CITY AND COUNTY BUILDING, DENVER



PLAN OF THE CIVIC CENTER, DENVER
 ALLIED ARCHITECTS ASSOCIATION OF DENVER, ARCHITECTS

THE ALLIED ARCHITECTS ASSOCIATION OF KENTUCKY

BY

OSSIAN P. WARD, PRESIDENT

THERE had been considerable discussion as to the forming of an Allied Architects Association of Kentucky. This was brought to crystallization and consummation by the opportunity to design some buildings for the University of Louisville. On March 31, 1925, the Allied Architects Association of Kentucky was incorporated under the laws of the state of Kentucky. This Association was organized primarily for the advancement of architecture in connection with the designing of public buildings, and not for the profit of its members. Quoting Article I of the by-laws: "The paramount purpose of this Association is to advance the art of architecture, and by professional coöperation and collaboration to secure for and provide municipal, county, state and national governments and organizations formed for civic betterment or mutual or business advancement with the highest and best expression of the profession of architecture at the least possible cost in the design and construction of buildings, structures and improvements." This organization will not accept commissions or perform architectural services for private individuals, firms or corporations.

The board of directors, of whom there are five, elected by the members of the Association, have the power to fix the compensation to be paid to its officers, representatives and employees. In the month of January of any year, the directors can at their discretion divide the profits acquired by the Association among the members whose membership has been continuous for a period of one year prior to the

date of said division. So far there has been no division of profits among the members of this Association. The conducting of the architectural work of the Association is carried on very much as it would be in any architect's office, except that the board of directors, instead of the individual architect or partners of a firm, manages all the affairs of the Association. The field of endeavor, however, being limited to public buildings, is very much restricted.

The board of directors selects the members best suited to take charge of the different branches of the work, and employs draftsmen and outside help whenever necessary. In connection with the only work that the Association has had to date, the board of directors became the executive committee and had charge of the preparation of plans and specifications and the supervision of the construction, holding frequent meetings during the progress of the work. It is not the intention of the Association to cut commissions or compete with architects outside of the Association, except, of course, in the field of public buildings, and even in this field there is a disposition to give the individual architects first chance, or at least every opportunity, to obtain the commissions.

A complete set of books is kept, and also a record of the cost to the Association of conducting the various branches of the architectural work. The question of legal responsibility is very important, and one that I may not be able to answer properly. So far there has been, in our experience, no occasion to decide any legal responsibility, but it would seem



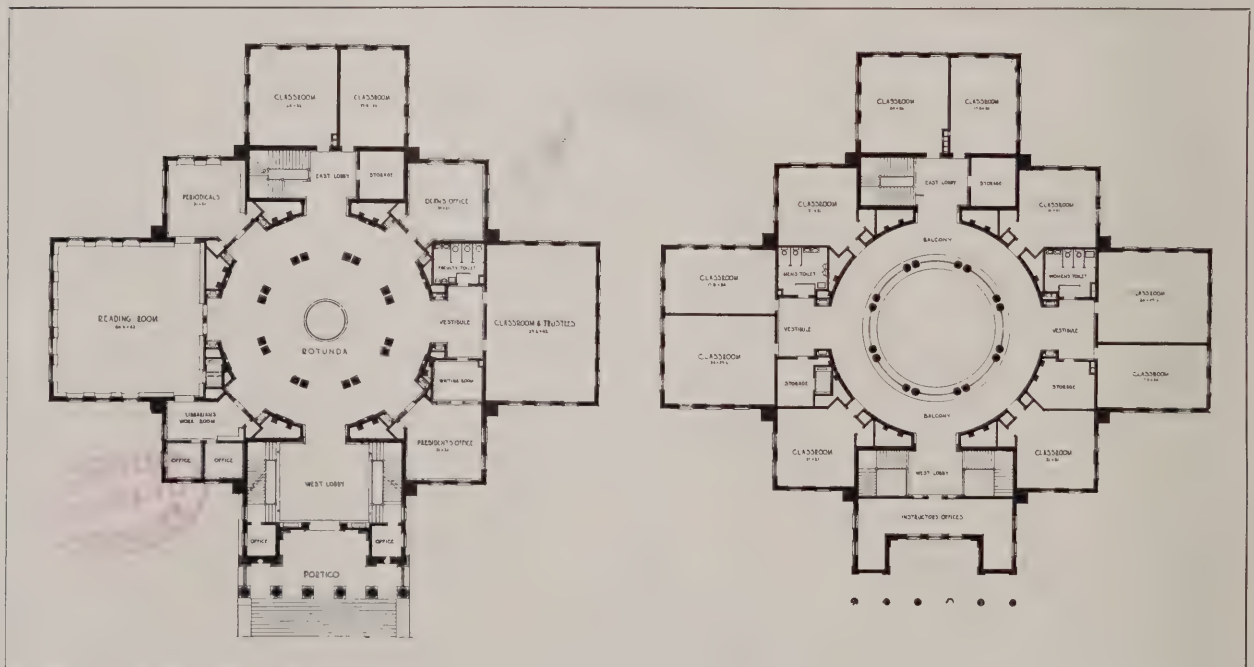
Administration Building, University of Louisville
Allied Architects Association of Kentucky, Architects

that what would apply to any other corporation in Kentucky would apply to the Allied Architects Association, incorporated under the laws of Kentucky. In our articles of incorporation it is provided that "the highest amount of indebtedness and liability which the corporation may at any time incur shall be \$30,000," and also that "the private property of the stockholders of the said corporation shall not be subject to any extent whatever to the payment of the debts and obligations of the corporation." The laws of Kentucky require that every corporation shall own capital stock, so each one of the 11 members of the Association owns three shares of stock of par value of \$33.33 each. No person shall own more or less than three shares of stock in this corporation, and every member has the same rights.

At the outset it appeared as though the University of Louisville would have \$500,000 or \$600,000 out of a bond issue of \$1,000,000 to expend for new buildings, and the Allied Architects Association obtained the contract to erect three buildings for the University. Unfortunately, the resultant funds dwindled, and so far the Association has designed only one building,—a new administration building, for the University of Louisville, costing, with driveway, approximately \$300,000. As this is the only work that the Association has performed, its success or failure must necessarily be rather limited. The building itself has been quite generally commended, and we hope will satisfactorily fulfill its purpose. The relations and associations of the various members of the organization working upon this project have been cordial, friendly and enjoyable, and it seems that there are many beneficial features in such an organization, provided enough work can be ob-

tained to permit proper organization and to hold the interest and coöperation of the members. On the other hand, there seems to be a difference of opinion, even among the members of the organization, as to the possibility of such an organization's working efficiently and satisfactorily. Our organization has been and still is in an experimental stage, and its future success or failure is dependent upon enough work to keep the Association together and interested; for no organization can endure and properly function without something to do. It also requires a leader who can devote considerable time to the affairs of the organization,—one who can inspire the members and arouse their interest and loyalty. Much can be done, and great benefit can be derived by the members of such an organization, provided that it is properly organized and governed. The things that militate against the success of such organizations as allied architects associations, are the complexity of modern life; the busy and crowded hours of most architects, which make it hard for them to devote much time to anything outside of their routine business; and the fact that it is harder for a group to come to a decision and function than for an individual.

In conclusion, in my humble opinion, an allied architects association may be very successful provided it is properly organized, led and has plenty of work. On the other hand, there can very easily be failure if there are little work and lack of leadership and interest on the part of the members. On the whole, it would seem that the advantages in an association such as this outweigh the disadvantages, and that bringing competing architects together into a group working for the same cause creates and fosters cordiality that would not otherwise be obtained.



Plans, Administration Building, University of Louisville
Allied Architects Association of Kentucky, Architects

CHARGING FOR PROFESSIONAL SERVICES

THE COST PLUS SYSTEM OF ROBERT D. KOHN AND ASSOCIATED ARCHITECTS

BY

MAUD M. ACKER

EDITOR'S NOTE. In the April issue of THE ARCHITECTURAL FORUM, William Stanley Parker wrote of the "Fee Plus Cost System for Architects," as employed in the office of R. Clipston Sturgis, Architect. Mrs. Acker describes the interesting cost-plus system used in the office of Robert D. Kohn and Associated Architects, which differs, in some respects from the method described by Mr. Parker.

WE have used the cost-plus charge for professional services in our office for many years and have found it works out to the advantage of the client and to our own. The form in which we write to clients is substantially given here:

"As you know, it is the usual practice of architects to charge a fee based on a certain percentage of the cost of the work executed. This has worked fairly equitably in the past. But in view of changing prices and other conditions it may not always work equitably now for both owner and architect. We have therefore in recent years proposed a plan to our clients which bases the payments to be made to us as architects entirely on the actual cost of the work we do, plus overhead and a reasonable profit. We protect the owner against any excessive cost by placing an upset maximum price. The owners pay us monthly for the amount of work done for them in the previous month. If the work goes along smoothly and no extraordinary complications arise they are likely to pay for our service a lesser total sum than would be involved under the old percentage rate of charge. If, on the other hand, the work is complicated or delayed by unusual conditions that arise, or if changes have to be made which involve additional drawings, the cost is more. But there is never any question as to what the amount charged should be, since the whole matter is based on actual expenditures in our office. The scheme which we propose for your building is as outlined in the next paragraph.

"We are to give full professional services including all the usual plans, details, specifications and superintendence for this work, and we are to receive as compensation therefor the direct cash expenditures of our office in the payment of the salaries of our staff and other assistants of any character for necessary work done while engaged on this project, plus 66 $\frac{2}{3}$ per cent for overhead, plus a charge for the time of the principals charged for on a salary basis when the time of the principals is devoted to this work, plus fees paid to structural engineers, plus one-third for profit, plus the net cost of blue prints and cash expense incurred for long distance telephoning, traveling expenses, etc. We hereby agree that the total amount which you will thus be required to pay us will not exceed the basic rate of . . . per cent of the proposed cost of the building work, as a basic fee of that amount would be calculated under

the normal conditions of practice mentioned in the latest schedule of the American Institute of Architects."

Our cost on an imaginary case would be kept in this way:

Draftsmen's time	\$100.00	
66 $\frac{2}{3}$ overhead	66.66	
Total	\$166.66	\$166.66
Principals' time (hourly salary basis)	\$ 50.00	
Engineer's fees	50.00	
	\$100.00	\$100.00
		\$266.66
33 $\frac{1}{3}$ profit		88.88
Blueprints		30.00
Cash expense		4.46
		\$390.00

We have often been asked how the principals keep a record of their own time and what they charge as their salaries. It will be noted that the scheme as defined in the contract includes in the cost of production the time spent by the principals. Each of the principals keeps a separate time sheet, just as do the draftsmen. To be sure, it is impossible for the principals to find more than half of their actual working time that can be directly entered on the time slips. This is due to the fact that it is impossible to charge up time spent in telephone conversations, dictation and general office supervision. A careful record kept for the better part of a year shows that the average is just about one-half of the number of working hours. That being the case, the principals' time entered for each commission is doubled. We have also been asked how we arrive at our overhead. We find that our costs for office rent, stenographers, materials, telephones, telephone operator, office boys, printing, etc. (all the unassignable costs) averaged for a number of years 66 $\frac{2}{3}$ per cent of the amount expended in the same years for directly assignable salaries of draftsmen and superintendents. In busy times the overhead is less,—at other times more. We have therefore thought it right to take the average of a number of years as a constant to be applied to every project in figuring the overhead. If a surplus accumulates under this heading in one year, it should be retained as a reserve fund to meet the deficit of another.

Aside from the overhead, an item of profit had to

be determined on. It was quite customary to assume formerly that something like 40 per cent of the total fees collected ought to be profit to the architect, the profit being the total amount which the architect himself was supposed to receive as clear of all expenses. Some architects claim that half of their total fees are profit, but we believed that to be exceptional, and that in the general run of work the expenses of a commission amount at least to 60 per cent. But in the instance given here the profit is calculated on a cost which includes the architect's salary. Accordingly, after considerable calculation and discussion, we reached the conclusion that $33\frac{1}{3}$ per cent would be a reasonable profit item to charge when based on such inclusive costs.

There are two or three considerations which are of importance in this cost-plus scheme. The first is that any waste in the office on the part of draftsmen or carelessness in duplicating work is naturally to the detriment of the client, just as would be waste in a cost-plus contract for building construction work. Though the owner is protected by the upset percentage fee, it might be claimed that there is still leeway enough for considerable waste, since we always make this upset maximum 1 per cent more than the usual Institute percentage fees. That is a valid criticism. It is up to the office unquestionably to guard most carefully against waste. We have found in our experience that on several occasions we felt called upon to credit an account with the salaries of men who had for one reason or another neglected their work or failed to produce drawings that were of value to the client. Such items are charged back against the profits of the office. In every such case the men in the office are informed of the items, so that they realize that this is a charge against their shares in the profits. The scheme of charging a distinct item for profit sets aside a certain fund which can be divided under a profit-sharing scheme with the whole office force. The architect himself has been paid a salary, an amount at any rate which gives him some return for his services, even if not an entirely adequate return. It is therefore simple to work out a profit-sharing scheme in which the workers can share in a reasonable ratio to the amount of profit.

The next important point is that the architect does not benefit by receiving an enormous fee on work that is simple, where the client makes few demands and where the work is repetitious; but he does not lose large amounts where the client is difficult and the work complicated, as is the case with some residential work. A New York architect in criticizing this scheme to Mr. Kohn one day said: "Your plan may be all right, but you can never make a killing"; to which was replied: "We do not have to make a killing, since under our scheme we make no loss on any commission." Under our plan an architect does not profit inordinately on one project and give his work away on another. The client pays for exactly what he gets. Another advantage under this scheme is that each month, the first of the month, a bill is

NAME <i>John Jones</i>		OFFICE OF ROBERT D KOHN & CHARLES BUTLER NEW YORK							
WEEK ENDING <i>Feb 17/28</i>									
	SAT.	MON.	TUES.	WED.	THUR.	FRI.	TOTAL FOR WEEK		
ARRIVE	9	9	9	9	9	9			
LUNCH		1	1	1	1	1			
RETURN		2	2	2	2	2			
LEAVE	1	5:30	5:30	5	5	5	HOURS	RATE	AMT
COMMISSION NO.	471	2	2			3	7	2	14
	320		1	3			4		8
	413	1					1		2
	408			4			4		8
	466	1	3		4		8		16
	470					4	4		8
	218			1/2			1/2		1
	440		1 1/2	3			4 1/2		9
448					7	7		14	
449									
TOTAL	4	7 1/2	7 1/2	7	7	7	40		\$80

Weekly Time Card Arranged for Charging Directly
Against Commission Numbers

rendered to the client for the expenditures of the previous month, plus overhead and profit. Without exception our clients have become accustomed to this plan and pay these bills promptly, and the whole financial health of the office has been improved since we do not run credit accounts. The old habit of borrowing money from the bank to carry on commissions is gone, we trust for good. Just as a reform, it would be well if the whole architectural profession adopted the habit of sending monthly bills, whatever might be the system of their charges. At the beginning of a project the client is always comparatively flush and is ready to pay bills, while otherwise, under the old plan, the architect has been the last one to be paid, because the client is often short of cash after paying the contractors. Under our scheme of monthly bills the greater part of the architect's fee is paid long before the contractor gets in his final work.

This outline of our plan is a somewhat revised and corrected statement of the working of our cost-plus plan as prepared by Mr. Kohn some years ago. Considering it now in the light of more than eight years' experience, we would not change back to the percentage basis under any circumstances. We have to acknowledge that once or twice we have come out badly on commissions, despite the cost-plus basis. The reason was that we fixed too low an upset percentage. In one case, on a hospital built at a remote point, we made a contract on the cost-plus basis with an upset percentage of 8 per cent plus traveling expenses and cost of a clerk of the works. Owing to a disagreement between the members of the medical staff, the work stretched over a great length of time and the costs ran inordinately high. But we maintain that had this been a straight percentage commission, the story would have been the same. It happened to be one of those cases where it was hard to prove, without going to court, that the nature of the changes imposed upon the architects justified extra compensation.

CUBIC FOOT COSTS OF BUILDINGS

BY

JAMES E. BLACKWELL, ARCHITECT

THE practical man always wants a "thumb rule"; speed is the demand of modern life; there is often no time for long calculations, and we begrudge the time it takes to make reliable estimates. As a draftsman once said, upon hearing a client's demand for speedy work, "a man will take a year to decide whether he will build or not, and when he does decide, he wants the plans finished day before yesterday." There is no short rule uniformly accepted as reliable in estimating the cost of buildings, and many times what is called an estimate, is what an old architect called "a mere *guesstimate*." There have been in use the methods of cost obtained by the cubic foot; by the square foot, or floor area; and by the room. Of these the cost by cubic foot seems to be the only one *approximately* reliable and used generally and for many years.

The cost by floor area is obtained by measuring the aggregate area of all the floors and dividing the total cost of the building by the total number of square feet. To get the approximate cost of a proposed structure, its floor area is multiplied by the cost per square foot of an actual building of the same type recently completed.

The cost by number of rooms is used by taking a building of known cost and rooms; dividing the number of rooms into cost, to ascertain the cost per room. This cost can be used as a constant in multiplying the number of rooms in a proposed structure to obtain the approximate total cost. This is the most unreliable of the three methods mentioned, as the cost per room may vary from \$500 to \$2,000 or \$3,000, depending upon the sizes of the rooms and the materials of which the building is constructed.

The cubic foot method was brought to this country from Great Britain and has been in use some 50 years or more, and so far as the writer knows, a table of costs and explanation thereof was first published in 1887, giving the cost per cubic foot of some 38 selected United States government buildings of various classes and materials of construction, ranging in cost from \$.08 for a frame building to \$1 per cubic foot for a granite, "fireproof" structure. It may be said at the start that a man without wide and long experience and good judgment cannot use this method with any reliability whatever. The practice is to obtain the cost per cubic foot of a known building and to use this rate per foot to multiply the measured cubic contents of a proposed structure to determine its cost. The proposed building, should, of course, be similar to the known structure in sizes of rooms, in total contents and in the materials of which the building is constructed. If it is not exactly so, then good judgment must be used in making due allowance for the differences. In measuring the cubic contents of a building, the

actual volume is usually taken from the outside of all walls and from the bottom of the foundations to the top of the roof, considering the slopes, towers, and dormers, chimneys, projecting courses and cornices as immaterial. In judging the rate per cubic foot a building should cost, careful consideration must be given to the sizes of the various rooms and enclosed spaces and the total size of the building, as well as the interior fittings, finish, the number of finished fronts and the kinds of materials of which they are constructed. Consideration must be given to the materials, such as brick, etc., and also to the construction of the interior partitions, frame or fireproof, and to the interior decorations, plaster, marble, tiling, etc. It is in this that the experienced judgment of the estimator is necessary,—in knowing the cost of completed buildings, in order to arrive at the cost of the structure and to make proper allowances, because very often a demand is made for such information in a very short time, and often before a line of the design or drawings has been made.

The accompanying table shows the cost of some fairly representative buildings constructed in Seattle and neighboring cities of the state of Washington, giving dates of completion and costs at those times, and the costs per cubic foot to conform to price costs of 1927, using for this conversion the changes as shown on page 128 of THE FORUM for January, 1928. These changes in prices taken from the chart assume 1913 and previous years as 100 per cent, and figures for subsequent years are: 1914, 98 per cent; 1915, 114; 1916, 156; 1917, 189; 1918, 190; 1919, 200; 1920, 268; 1921, 198; 1922, 171; 1923, 186; 1924, 194; 1925, 190; 1926, 187; and 1927, 185. The table printed herewith includes 69 buildings, 41 fireproof and 28 of cheaper construction, compiled from the best sources obtainable (generally the architects' figures). Using the costs as of 1927, this table gives 17 office buildings, varying in cost per cubic foot from 32 cents to 74.8 cents, average 52.6; two hotels, 40 and 60 cents; four apartments, 44 to 58.7 cents, average 51.2; four theaters 26.7 to 44.2 cents, average 36.9; nine loft buildings, 12.6 to 25.1, average 18.9; and five school buildings, 22.3 to 30.8, average 25.8 cents. This table of such varying costs shows conclusively the necessity of having the completed and the proposed buildings approximately the same in size, in number of rooms and in construction. It also shows somewhat the effect in costs of much decoration and yet large inside spaces, as in theaters, compared to buildings having less decoration but many small spaces or rooms, as in office buildings or hotels. The buildings of cheaper construction shown in the table are simply given as statistics for varieties in uses and construction, varying in cost from 9 to 54 cents per cubic foot. These

may be used only when the proposed building is similar to one of these. It is to be noted, however, that even in this type of building, larger structures often cost less per cubic foot than smaller buildings.

The writer has a list of costs of many residences, but they vary so greatly in cost, plan, equipment and finish that they would be of no value as a guide in estimating. The accompanying table may be of some aid to architects and builders in cities other than Seattle, but as there is a wide difference in costs of materials and labor in various cities, a table of costs in each city would be of more value. It is to be hoped that tables will be prepared for other large cities.

The estimator in comparing the requirements of the proposed building to those of a structure of known cost should know the relative costs of materials and labor in the different cities and the dates of construction. He must know the class of building, its purpose; whether fireproof, mill or ordinary construction; the kinds of finish for interior and exterior walls, etc., and the class of people who are to occupy the proposed building. Manifestly, in connection with the last item, the kind of building required for a hotel or apartment for laborers, sailors, or lodgers, would not be as expensive as a first class hotel or apartment. The kind of apartment for well bred, well educated people, but of moderate means, would not be as elaborate and expensive as for

the very wealthy. The variations in customs or in demands in different cities are sometimes very great; for instance, the demand for apartments in Seattle and many western cities is for two- or three-room suites,—seldom more than four or five rooms, with rents varying from \$70 to \$125 per month; while in New York, Chicago, Washington and some other eastern cities there may be considerable demand for apartments of from 10 to 15 rooms, renting for from \$800 to \$1500 per month. In such cases the rates given in the table for apartments would be of no value for comparison.

Of course, no thumb rule is as good as a detailed estimate, and the latter is not as conclusive as *bona fide* bids; but neither can be reliable until after working drawings and specifications have been made. An owner never wants to pay for all this architectural service as long as there is a doubt of proceeding with the building, and he always asks for an estimate before proceeding beyond the preliminary drawings stage. The estimates based on cubic foot costs are never accurate, except by a lucky coincidence, but they do serve a useful purpose in approximating the cost in the quickest way yet devised. An expert in actual costs can give a much more reliable estimate if he is provided with carefully drawn plans and an outline specification. Such an estimate can be made quickly by an experienced man.

COST OF BUILDINGS IN SEATTLE PER CUBIC FOOT FIREPROOF BUILDINGS

Name of Building	Year Built	Use or Occupancy	Construction Type	Number of Stories	Total Cubic Feet	Total Cost	Actual Cost Per Cu. Ft.	Cost Per Cu. Ft. As Of 1927
Bigelow	1923	Office & Stores	R.C.	7	60 x 120	.....	45 cts.	45 cts.
Lloyd	1926	" "	"	16	819,910	.....	52	52
Shafer	1924	" "	"	16	866,320	\$385,733	44	42.2
Alaska	1905	" "	S.F.	14	1,823,040	690,600	37.8	69.9
White	1911	" "	R.C.	14	.....	.....	36	66.6
Henry	1912	" "	"	14	.....	.....	34	62.9
Cobb	1914	" "	"	14	.....	.....	40	74.8
Eagles Temple	1924	Aud. Office & Stores	"	10	2,050,090	1,010,984	49.3	49.3
Northern Life Tower	1928	Office	"	27	2,710,926	1,500,000	55.3	55.3
Puget Sound Power & Light	1925	Office	"	2	201,600	66,529	33	33
Mutual Life Annex	1905	" & Bank	S.F.	6	297,000	106,804	36	66.6
Dexter Horton	1924	" "	R.C.	14	4,883,760	2,250,000	46.1	46.1
Medical & Dental	1924	" "	"	18	2,533,044	1,535,000	60	60
Telephone	1921	" "	"	13	2,208,690	1,307,000	59.2	54.6
Vance Hotel	1926	Hotel & Stores	"	10	814,928	.....	60	60
Stratford Hotel	1927	" "	"	9	580,860	235,060	40	40
Terminal Sales	1923	Stores & Lofts	"	11	1,309,900	329,971	25.1	25.1
Hubbell Building	1922	" "	"	2	498,688	106,256	21.3	23
Hanford Building	1921	" "	"	2	349,333	50,350	14.4	13.4
Grunbaum Store	1921	" "	"	4	1,850,350	337,177	18.2	17
McDowall	1926	" "	"	9	1,417,000	468,000	32	32
Republic	1927	Loft	"	10	.....	.....	41	41
Liggett	1926	" "	"	10	.....	.....	42	42
Century Addition	1923	" "	"	5	.....	.....	21	21
Sherman-Clay W. H.	1924	" "	"	3	772,800	.....	20.4	20.4
Tyee Building	1925	Garage & Lofts	"	2	682,240	147,486	21.6	21.6
Kelly-Springfield	1920	" "	"	2	219,000	40,000	18.2	12.6
Louisa Frye Building	1926	" "	"	3	358,441	57,278	16	16
Mann Building	1926	Store-Theater-Lofts	"	2	789,702	210,264	26.7	26.7
Paramount Seattle Theater	1927	Theater	"	8	2,833,920	1,250,000	44.2	44.2
New Orpheum	1927	Theater, Moving Picture	"	6	2,300,204	1,000,000	43.4	43.4
Mayflower Theater	1927	" "	"	6	2,256,400	750,000	33.2	33.2
Lawton Apartments	1925	Apartments	"	7	.....	.....	57.5	57.5
Windham Apartments	1925	" "	"	7	329,820	193,066	58.7	58.7
Stockbridge Apartments	1925	" "	"	6	567,000	253,106	44.6	44.6
Paramount Apartments	1927	" "	"	8	568,770	250,000	44	44
St. Benedict's School	1924	Boys' School	"	2	433,000	133,511	30.8	30.8
Bryant School	1926	Grade	R.C.-Fr.fl.	"	593,000	164,076	27.7	27.7
Marshall School	1926	" " Junior	" " "	"	1,989,278	442,812	22.3	22.3
Garfield School	1922	High	" " "	"	2,430,000	619,394	24.5	27
Roosevelt School	1921	" "	" " "	"	2,800,000	899,800	32.2	30

NON-FIREPROOF BUILDINGS WOOD FLOOR CONSTRUCTION

Name of Building	Year Built	Use or Occupancy	Construction Type	Number of Stories	Total Cubic Feet	Total Cost	Actual Cost Per Cu. Ft.	Cost Per Cu. Ft. As of 1927.
School at Mt. Vernon	1921	High School	Brick		715,000	\$167,000	23.4 cts.	22.2 cts.
School at Blaine	1925	"	R. C.		210,000	36,500	17.5	17.5
School at North Bend	1921	Grade "	Brick		266,000	55,158	20.7	19.3
School at Ronald	1913	"	"	2	108,650	10,080	9.3	17.2
L. & M. Stores	1925	Stores	Masonry & Wood	1	.....	.....	14	14
Gov. McGraw Stores	1909	" & Bus. School	"	3	343,440	27,616	8.1	15
Backus Building	1909	" & Lofts	R. C. & Mill	4	506,250	48,327	9.6	17.8
Graves Building	1908	"	"	4	436,800	40,864	9.4	17.4
Sears-Roebuck, Mail Order Bldg.	1916	"	"	6	2,732,460	202,000	7.4	9
Willis-Overland Bldg.	1925	Garage	"	2	50' high	.....	9.8	9.8
Chanslor & Lyon Bldg.	1919	"	"	2	700,000	101,220	14.3	13.2
Alvin Investment Co.	1924	"	"	3	462,000	49,268	11	10.5
Colsky Stores	1926	Stores & Garage	Brick & "	1	262,000	26,070	10.3	10.3
Wenatchee Realty Co.	1910	" & Apts.	Masonry & Wood	3	471,120	72,000	15	27.8
Nesika Apts.	1915	54 Apts. 2 & 3 Rooms	Brick & Mill	5	333,360	64,756	19.4	31.4
Lake Investment Co.	1926	"	"	3	231,700	65,000	28	28
L. & M. Apartment	1924	Apartments 34	Masonry & Wood	3	.....	.....	37	35.3
L. & M. Apartment	1921	Apartments 30	"	3	.....	.....	28	26.2
Fairfax Apartment	1923	Apartments	"	3	152,779	51,634	33.8	33.8
Carnegie Libr'y, Olympia	1914	Library	"	1	166,406	21,768	13.1	24.5
Carnegie Libr'y, Wenatchee	1912	"	"	1	65,996	9,506	14.4	27.6
Delta-Upsilon House	1924	Fraternity House	"	3	134,750	40,689	30	28.5
Theta-Xi	1926	"	"	3	112,640	38,463	34	34
Alpha Sigma Phi	1920	"	"	3	140,000	48,000	34.2	23.6
Inglewood Club	1926	Country Club	"	2	447,900	133,017	30	30
C. M. & St. P. Gateway	1927	R.R. Hotel & Sta.	"	2	455,303	247,772	54	54
Armory N.G.W., Bellingham	1911	Drill Hall & Co. Rooms	Stone	3	851,640	64,880	7.6	14.1
Gray's Harbor Power House	1908	Steam Power Machy.	Brick & Mill	2	541,440	59,987	11.1	20.5



Sigma Alpha Epsilon House, University of Washington, Seattle
Stuart & Wheatley, Architects

THE FAIREST OF COMPETITIONS

BY

WILLIAM O. LUDLOW

OF LUDLOW & PEABODY, ARCHITECTS

SO many times have I told my spellbound friends the inside story of that marvelous feat of legerdemain,—the taking of a two-million-dollar commission out of a hat,—that I don't mind telling it again.

It happened this way: Frank Manville, president of the Johns-Manville Corporation, decided that his company must have a larger building to take care of its larger business. So far easy enough; they had the land, the money, the will to do; but immediately Mr. Manville was faced with a staggering question,—how could he select one architect, from all the architects who had been giving him business, without offending the individuals of the entire profession,—save one,—and without thus jeopardizing the future of the Johns-Manville business? If, for instance, he handed the commission outright to Cass Gilbert, imagine the look of scorn on the face of Whitney Warren's specification man when next the Johns-Manville salesman suggested asbestile for the latest Park Avenue skyscraper! Again, if he held a competition, he knew he would be set down as a man of execrable taste and bad judgment by the personnel of the entire profession,—save one,—when the winning design was exhibited! While pondering this difficulty one day, one of his men (said to have been originally on the stock exchange) suggested to Mr. Manville: "Why not let them *draw* for it?" Mr. Manville, naturally a quiet and cautious man, at first laughed at the joke for, knowing the haughty dignity and the high ethical standards of the members of the profession, he didn't propose to insult his good friends and customers.

The foregoing is from reputable hearsay;—from now on I speak from personal knowledge. One day a well known officer of the Johns-Manville Corporation appeared in our office and asked if it would be beneath our dignity or contrary to our ethical standards to take a chance on drawing from a hat an opportunity to design the new Johns-Manville building. Of course we said that it certainly would,—but possibly we might consider the matter,—just this once. We understood that some of the members of the profession thus approached did not take the same high ground that we did, but trampling on all principle, simply answered: "We would be glad to." A few days later we received a personal invitation for a "representative of our firm" to a luncheon given by Mr. Manville at the Union League Club. As there happen to be two representatives of our firm, we decided that the firm would not be adequately represented unless both went,—not harboring for a moment the thought that some firm might have only one representative when the hat passed!

Twenty of us sat down to a big round table overburdened with delicious food. Finally, we recognized

a cool, yellow, sparkling liquid served in beer mugs, and then the stillness was broken by Mr. Manville, as he arose with a derby hat in one hand and a bunch of little white envelopes in the other. In a few well chosen words he told his guests of his proposed project and said that he had confidence that any one of the gentlemen present would design for him a suitable building, adding that he would be glad to give it to all of us, but as that method might be unsatisfactory, would we kindly each one draw from the hat an envelope? In each envelope, he said, was a blank card excepting one in which would be found a card saying "You Win," and he would like the man who drew that card to be his architect. As the fateful hat went around each man dipped in. I hasten to interject here, to avoid being suspected of double dealing (perhaps that is in the wrong metaphor), that my partner was so scrupulously generous and honest, that he passed his opportunity over to his partner; was ever virtue so instantly rewarded? I am going to ask Briggs to draw a cartoon entitled "What does a man think about when he holds in his hand an envelope containing either a two-million-dollar commission,—or nothing?" Something like this went through my benumbed mind:—In this little envelope a skyscraper or a blank piece of paper! One chance in twenty! Pshaw, that's what I take every time I jay-walk across Fifth Avenue, and I've never been hit yet! I wonder whether Tom Hastings, or Breck Trowbridge, or Whitney Warren will get it!

"Now," said Mr. Manville, "begin here and open up,—each one announcing in turn what he has drawn." With painful slowness the words began to come to my somewhat clouded mind,—"Nothing doing," "Blank," "Blank," "Left again." Then the brilliant deduction began to dawn in my mind that if all the others got *blank*, I got *it*! The suspense was terrible, so with my table knife I slit my envelope and cautiously pulled a little at the card inside,—cat and mouse performance. Hello, what's this! A tiny wreath appears;—yes, I suppose they all have wreaths on them like other tombstones. Great ——"You Win!" I took the blow just like Tunney,—manfully,—everything went around inside my head, but at the count of ten I recovered, found everybody still there, and sat trying to look like a sphinx but feeling like an opium addict. Then John Cross, who had peeped at my card, spilled the beans by shouting "Here he is!" I faintly heard yells of "Speech! speech!"

Twenty handshakes from as many slightly disappointed but complacent men;—then, "Glad you fellows are going to be my architects, I want to begin right away, see you tomorrow,"—and so ended the fairest and most satisfactory competition on record.

PLANNING RELIGIOUS EDUCATIONAL BUILDINGS

BY
M. W. BRABHAM

THE phenomenal increase of interest and investment in religious education during the past ten years has been followed by a like increase in attention to the standard requirements for buildings suited to the purposes. Leaders in religious education are today considering their work in a manner approaching if not equaling the seriousness of leaders in general education processes. This has resulted in the study and gradual development of a new type of building which is a far cry from the "Sunday School room" or "annex" of a few years ago. The introduction of a definite program of training involving theories and practices in educational processes of a religious nature extending far beyond the customary one-hour Sunday School, calls for structures as carefully planned and equipped as the best educational buildings for public schools. The numerical growth has also been astonishingly large, until today it is not an unusual thing to find structures accommodating from 1000 to 5000 persons.

The Sunday School is coming to be known generally nowadays as the "Church School," the very name implying a change of emphasis and a broadening of program. The school for religious work is graded in all its educational processes, and this is calling for buildings also graded in arrangements. Within the organization there are eight age groups commonly recognized, these being based on well founded psychological principles. Within each of these eight age groups there are subdivisions by grades and classes. The program for each age group varies in essential points, all of which calls for different arrangements as to sizes, shapes and general appointments of rooms. This can be readily seen as a highly specialized field, demanding preparation and experience not commonly regarded as a part of the general architectural preparation of those practicing in this field. To date the number of architectural organizations employing specialists in the field of religious administration and theory is very small, but the probabilities are that these workers will be engaged for handling such aspects of the work in increasing numbers. There are several available books on the subject which may be found helpful to architects in connection with this special line of service: "Building for Church Work and Life," by Mouzon William Brabham (Cokesbury Press, Nashville, 1928); "Building for Religious Education," by Henry Edward Tralle and George Merrill (The Century Company, New York, 1925); "A Complete Guide to Church Building," by P. E. Burroughs (Baptist Sunday School Board, Nashville).

The schedules printed here have been worked out as a general guide for architects and committees to be used in determining some important features of religious educational buildings.

TABLE I
Church School Having 900 Members

Group	Ages	Per Cent	No. of Pupils	Sq. Ft.	Assembly Rooms	Classrooms	Members Per Class
Cradle roll	1-2-3	5	45	675	2	0	
Beginner	4-5	8	72	1080	1-2	0	...
Primary	6-7-8	10	90	1350	1	9	8-10
Junior	9-10-11	10	90	1350	1	9	8-12
Intermediate	12-13-14	10	90	1350	1	7-10	8-15
Senior	15-16-17	10	90	1350	1	7-10	8-20
Young people	18-23	20	180	2700	1	6-8	15-40
Adult	24 upward	27	243	3645	1	6-9	15-150
Total			900	13,500	9	44-55	

Adults may use main auditorium of church for assembly if necessary.

Note. Classrooms not opening into the assembly room are to be preferred where shape of lot and size of building lend themselves to this arrangement.

Other Rooms. Social hall, which may also be the assembly room for one of the departments of pupils above 12 years old; kitchen and serving rooms; mothers' room or rooms, in close proximity to the cradle roll; women's parlor or parlors; boy scout and camp fire girl rooms, both of which may be figured in floor space for either intermediate or senior classes; chapel adapted to prayer meetings and other gatherings, which may be used as an assembly for one group, such as intermediate or senior. Rooms adapted to meetings of young people; these may also be used for an assembly or for large classes; pastor's office and study; room for pastor's assistant or assistants; church offices; Sunday School officers' room; library and reading room; coat room facilities; toilets; cabinets in each assembly room and in library; storage and janitor's room; gymnasium, where local conditions require it and where adequate supervision will be maintained. Minimum size classroom: 8 x 10 feet. Blackboards should be provided in classrooms and in assembly rooms.

TABLE II
Church School Having 1200 Members

Group	Ages	Per Cent	No. of Pupils	Sq. Ft.	Assembly Rooms	Classrooms	Members per Class
Cradle roll	1-2-3	5	60	900	2	0	
Beginner	4-5	8	96	1,440	2	0	...
Primary	6-7-8	10	120	1,800	1	12-14	8-10
Junior	9-10-11	10	120	1,800	1	10-12	10-12
Intermediate	12-13-14	10	120	1,800	1	10-12	10-15
Senior	15-16-17	10	120	1,800	1	9-12	10-20
Young people	18-23	20	240	3,600	1	7-12	15-40
Adult	24 upward	27	324	4,860	1	6-10	15-150
Total			1,200	18,000	10	54-72	

Note. Classrooms for primary and junior groups should be apart from the assembly room when size and shape of lot permit separate arrangement. The number of classrooms for each of these groups may be reduced by providing for one-half to be in classes while the other half is in assembly.

Other Rooms. Social hall, which may also be used as an assembly room for one of the departments,—this room should accommodate from 800 to 1000; kitchen and serving room; kitchenette convenient to room or rooms used for smaller social gatherings or young people's department; mothers' rooms (2) convenient to cradle roll rooms. These may be counted in as a part of the total floor space for adult classes; women's parlors (2), which may also be used as adult classrooms, or one may be arranged for young people; boy scout and camp fire girl rooms, which may also be counted in total classroom space for either the intermediate or senior classes; pastor's study; pastor's office and conference room; church offices; assistant pastor and director of religious education (2 rooms); Sunday School officers' room or rooms; library and supply room; reading room, which may also be training classroom and figured in total classroom space for young people; coat room facilities; toilets; storage and janitor's room or rooms; gymnasium. Minimum size of classrooms: 8 x 10 feet. Blackboards in classrooms.

TABLE III
Church School Having 1600 Members

Group	Ages	Per Cent	No. of Pupils	Sq. Ft.	Assembly Rooms	Classrooms	Members per Class
Cradle roll	1-2-3	5	80	1,200	2	0	...
Beginner	4-5	8	128	1,920	2	0	...
Primary	6-7-8	10	160	2,400	1	16-20	8-10
Junior	9-10-11	10	160	2,400	1	16-24	8-12
Intermed.	12-13-14	10	160	2,400	1	12-20	8-15
Senior	15-16-17	10	160	2,400	1	10-18	10-20
Young people	18-23	20	320	4,800	1	10-14	15-50
Adult	24 upward	27	432	6,480	1	8-10	15-200
Total			1,600	24,000	10	72-106	

Note. Junior and primary classrooms should not open into assembly room unless the size and shape of lot make other arrangements impossible. The number of classrooms for each of these departments may be reduced by planning for one-half of the department to be in class session while the other half is in assembly. This is an administrative matter for the local school.

Other Rooms. Social hall, which may also be the adult or young people's assembly room,—this room should care for at least 1,000 to 2,000; kitchen and serving rooms; kitchenette for smaller gatherings; mothers' rooms (2) near cradle roll rooms may be counted as adult classes; women's parlors (2 or more); church parlor and steward's rooms, boy scout and camp fire girl rooms; also counted as interme-

diate or senior classrooms; pastor's study; pastor's office and conference room; assistant pastor's room; room for director of religious education; church offices and vault; storage and janitor's rooms; library; reading room; Sunday School officers' rooms; coat rooms; toilets; gymnasium and locker rooms; chapel for prayer meetings, which may also be assembly room; rooms adapted to young people's meetings; men's club room; girls' club room; boys' club room; nursery.

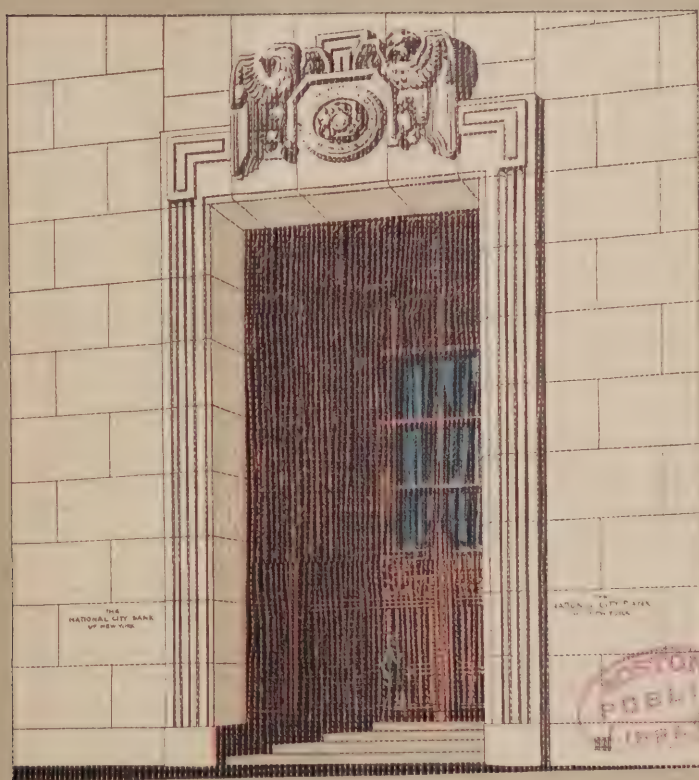
TABLE IV
Church School Having 2,000 Members

Group	Ages	Per Cent	No. of Pupils	Sq. Ft.	Assembly Rooms	Classrooms	Members per Class
Cradle roll	1-2-3	5	100	1,500	3	0	...
Beginner	4-5	8	160	2,400	3	0	...
Primary	6-7-8	10	200	3,000	2	20-22	8-10
Junior	9-10-11	10	200	3,000	2	18-20	8-12
Intermed.	12-13-14	10	200	3,000	1	18-20	8-16
Senior	15-16-17	10	200	3,000	1	18-20	10-20
Young people	18-23	20	400	6,000	1	12-16	15-50
Adult	24 upward	27	540	8,100	1	10-15	15-200
Total			2,000	30,000	14	96-113	

Note. Junior and primary rooms may be reduced in number by planning for one-half of the department to be in class work while the other half is in assembly, but this is an administrative matter to be worked out locally. Classrooms for these two departments should be separate from the assembly rooms, preferably not opening into the assembly room at all.

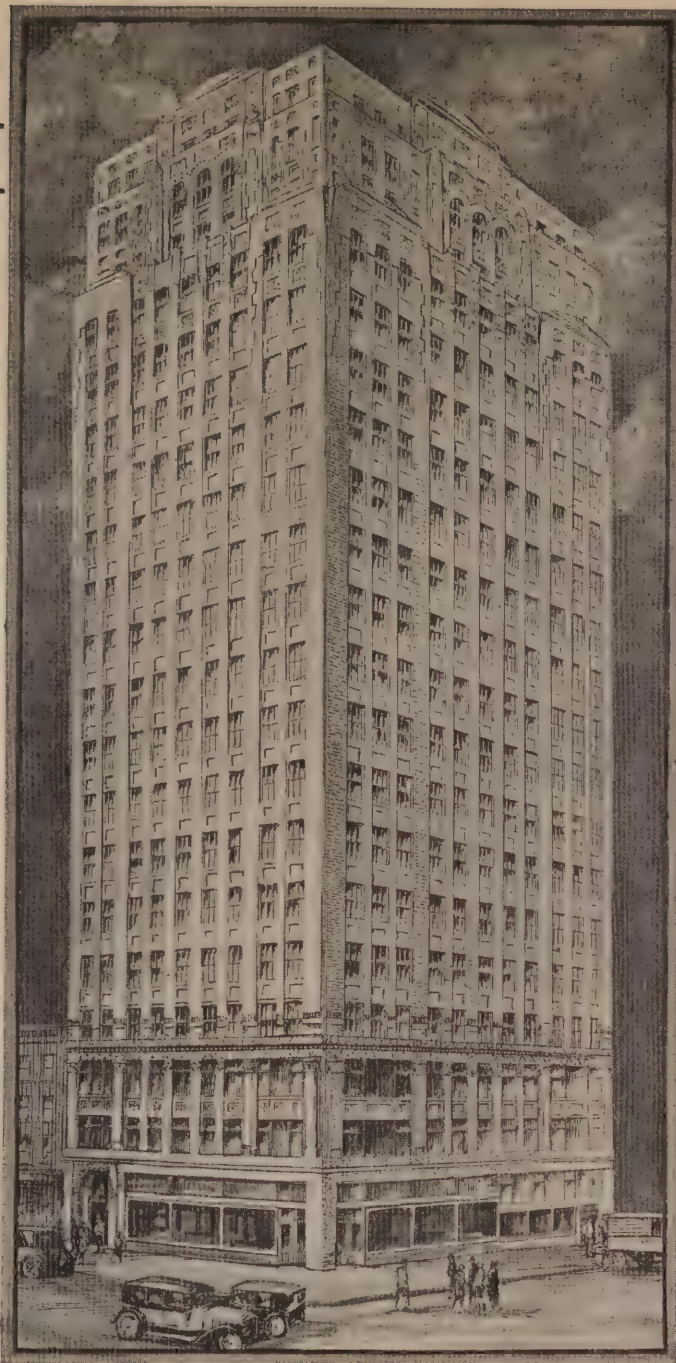
Other Rooms. Social hall, accommodating from 1,200 to 1,400, to be used as adult or young people's assembly; kitchen and serving room nearby; kitchenettes within easy reach of smaller rooms for social purposes; mothers' rooms (3) near cradle roll rooms; these may be counted in as part of space for adult classes; parlors (3 to 5) may be used as classrooms if necessary; boy scout rooms (2); camp fire girl rooms (2),—they may be used as classrooms for intermediate or senior classes; club rooms,—young women (1); boys' (1); girls' (1); women (1); men (1); young men (1). Some of these, if located conveniently, may also be used for classes. There shall be administrative rooms: pastor's study (1); pastor's office and conference room (1); assistant pastor (1); director of religious education (1); church offices (2 to 4); vault (1); janitor's rooms (2); library (1); reading room (1); Sunday School officers' rooms (2); chapels (2 to 4). These may be used as prayer meeting rooms and as assembly rooms in some cases. There should be a gymnasium with locker and shower rooms for each sex; blackboards in all class and assembly rooms; cabinets in all department rooms built in to side or rear; coat rooms; toilets; drinking fountains; nurseries and rest rooms.

THE
ARCHITECTURAL
FORUM
IN TWO PARTS



PART ONE
ARCHITECTURAL DESIGN
JUNE
1928

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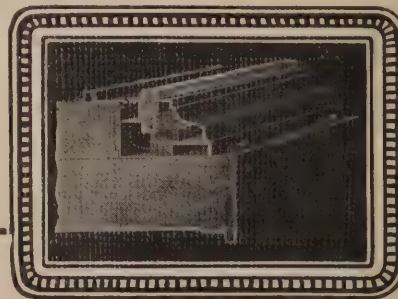
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Published Monthly by

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Paul W. Hayes, Vice-Pres.; Robert Sweet, Sec. and Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, \$7.00. Canada, \$8.00. Foreign Countries in the Postal Union, \$9.00

Single Copies: Quarterly Reference Numbers, \$3.00; Regular Issues, \$1.00. All Copies Mailed Flat
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BOOK DEPARTMENT

AMERICAN ARCHITECTURE OF TODAY

THIS volume by Professor Edgell, Dean of the Faculty of Architecture at Harvard, is unquestionably one of the year's most significant architectural works, not only to the practicing architect but also to the layman who takes an intelligent interest in all the phenomena that play a part in modern American life. Let us first glance at the physical make-up of the book and the scope of its utility, and afterward at the character and value of its contents. It is a large volume of 401 pages with 375 half-tone illustrations. There are four chapters,—possibly they might be called sub-divisions,—dealing respectively with “The Development of American Architecture”; “Domestic and Academic Architecture”; “Ecclesiastical and Monumental Architecture”; and “Commercial Architecture.” There is also a full and admirably arranged bibliography. Following the list of illustrations, there comes a classified table of buildings under the headings,—banks, bridges, capitol and town halls, churches, libraries, clubs, museums and all the other types of structures that would naturally fall into well defined groups. This detail obviates the necessity of having an index, and it can be referred to with ease.

Of all the arts by which the general public is affected in greater or less degree, architecture is the most inescapable in our daily contacts; it is also the least commonly understood or appreciated. The unfortunately

widespread fallacy that architecture is so completely technical in theory and application that it is altogether beyond the ken of the average layman is doubtless responsible for an apparent lack of public interest in or concern with an art that intimately touches one and all. That this attitude should be wholly changed is highly important for the good of the art itself; popular understanding and appreciation of architecture must inevitably redound to the benefit of any art so universally and so necessarily engaged in. Professor Edgell's book marks a distinct step forward toward the realization of this ideal condition, and it provides a substantial means of placing architecture within the range of the average layman's understanding. The volume, as a matter of fact, is primarily intended for the layman. In his preface Professor Edgell writes that the work is “addressed to laymen. Indeed, it is a layman's review for laymen. The writer is not a professional architect, but a student of the history of art. Moreover, he has no claim to special expertness in the field of modern architecture. As a student of the history of art, a critic and observer of beauty, he was asked to review for laymen some of the tendencies of the fascinating architecture of America today. The book is the result.” This “result” is a comprehensive, human and lucidly expressed review of the whole field of American architecture from its hum-

The Smaller Houses and Gardens of Versailles

By Leigh French, Jr. and Harold D. Eberlein

FOR the moderate-sized American suburban or country house there is nothing to follow in the way of a type at once more beautiful and more practical than the seventeenth and eighteenth century French houses of the same kind. The type possesses that graceful balance in the way of exterior design and that slight degree of formality of interior which is being expressed in current domestic work of the same character; and from all the domestic buildings of seventeenth and eighteenth century France there is nothing which offers a more fruitful basis for study than the smaller villas built near Versailles for the attendants of the French court. These buildings possess in an unusual degree just those qualities in the matter of design now most sought for in America.



THIS volume, prepared by two students of French and American architecture, is a practical study into the adaptation of the simpler French forms to American conditions. There is not one of the many villas illustrated which does not afford abundant suggestion in the way of exteriors to present-day architects, and the interiors with their simple and graceful disposition of wall paneling, mantels, and stairways abound with suggestions for working out interiors to accord with the expression given by the buildings' exteriors. Plans in many instances are easily adapted for use today, and the arrangements of the gardens and other outdoor areas offer suggestions for making these important adjuncts to American suburban or country houses heighten the character and interest of the buildings themselves.

202 Pages, 9¼ x 11¼ Inches. Price \$6

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Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

French Farm Houses, Small Chateaux and Country Churches

By *Antonio di Nardo*

With Preface by Paul P. Cret



THE buildings of no country offer more in the way of inspiration for present-day architects than those of France. French towns and villages are filled with fine old houses and shop buildings, and the countryside abounds in farmhouses, farm structures singly or in groups, manor houses large or small, and the rural churches and wayside shrines which are among the most beautiful buildings of their kind in the world. All these structures by reason of their direct and practical designing supply the best possible precedent for modern work.

This volume contains more than 300 half-tone illustrations of buildings of this character, and in many instances illustrations of details are given, with drawings showing the bonding of brick or the arrangement of half-timber construction. *The work would be worth many times its cost to any architect interested in the design of domestic buildings and small churches.*

176 pages, 12 x 16 ins.

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NEW YORK

ble beginnings in the early colonial era down to the manifold current developments of the present day. Professor Edgell is not only sound in his conclusions but he has also an apt way of presenting his material in a pleasant manner that engages and sustains the reader's interest.

In the first chapter, "The Development of American Architecture," he traces all the varied influences that affected building in the colonial period and supplied the foundations on which the subsequent growth is based. All the divers racial elements and hereditary preferences are duly explained, with appropriate allusions covering the entire geographical stage from the English heritage of New England and Virginia to the French infusion of New Orleans, and the Spanish legacy of California. In this *resume* one could have wished that a little more specific credit had been given to the evidences of Swedish and Welsh strains in the early architecture of Pennsylvania, but otherwise the attributions of racial influences are remarkably just. Besides reviewing very thoroughly the growth and development of domestic building, the author devotes a full share of consideration to the evolution of church and civil architecture. The discussion is not restricted to a dry record of material occurrences, but the impulses and ideals that actuated each generation are clearly summarized. For example, attention is called to the wave of romanticism that spread over the entire country in the first half of the nineteenth century and that resulted in the building of Trinity Church, New York, by Upjohn, and St. Patrick's Cathedral by Renwick. The Romanesque episode, an offshoot of the romanticist movement, is likewise chronicled, with illuminating comment on the work of H. H. Richardson and those who followed closely in his footsteps. All through this chapter, along with the record of actual structural progress, runs a story of the men whose personal tastes and labors shaped the course of current design. One significant portion of this chapter deals with the types of public architecture called forth by the various world's fairs and expositions that began with the Centennial of 1876, in Philadelphia, and continued through the brilliant achievements that marked the work at Chicago, San Francisco and San Diego. The chapter concludes with the marvelous story of the genesis of the skyscraper, bringing us down to the principles involved in the erection of office buildings of the latest type.

With the same thorough analysis, the same clear perception of all the issues and factors involved, and the same agreeable lucidity of presentation, the review of contemporary domestic and academic architecture is presented to the reader, accompanied by abundant illustrative material that has been chosen with searching discrimination. No less engaging and no less valuable for its critical insight is the third division of the book, devoted to ecclesiastical and monumental architecture. The conclusions inevitably reached, and buttressed by the frequent comparisons which the numerous illustrations make possible, are calculated to inspire a distinctly optimistic outlook for the future of American building. Commercial architecture of all types, from shop fronts to bridges, railway stations and warehouses, to say nothing of manufacturing establishments, takes up considerable space as the last section of the volume.

While, as already said, this book is intended primarily for laymen, and is designed to increase understanding

and appreciation of architecture among the general public, it will be found no less stimulating and valuable to the professional architect. It is, in fact, a summary of architectural practice in America from the seventeenth century to the present day. Such a review cannot fail to prove a mine of useful suggestion for anyone.

AMERICAN ARCHITECTURE OF TODAY. By G. H. Edgell. 401 pp., 8 x 6 ins. Price \$6. Charles Scribner's Sons, New York.

COLOR SCHEMES OF ADAM CEILINGS, Portfolio; Introductory notes by Gerald K. Geerlings. Five plates in color, 9½ x 12½ ins. Price \$2. Charles Scribner's Sons, New York.

FOR some reason there seems to have grown up the belief or tradition that an interior to be in character with the type of architecture developed by Robert and James Adam must necessarily be if not rather colorless and pallid at least made to employ chiefly white or tints which are light if not actually pale; creams, grays, buffs, and the lighter tones of other colors. It is true, of course, that examination of interiors which were designed by the Adam brothers and carried out under their direction would prove rather the contrary to be the case, but more than a century has elapsed since the Adam brothers ceased to design and execute, and even in England, where destruction of the old goes on rather less rapidly than in America, interiors by the Adams are by no means numerous, and often, because they are in remote places or in buildings still used as private residences, they are not available for examination by students. It is interesting and helpful, therefore, to have for guidance certain original designs for interiors, executed actually by the Adam brothers or at least under their presumably careful and critical direction, showing the use of colors which are possessed of strength and vitality without sacrificing that delicacy which is one of the chief and certainly one of the most engaging attributes of the Adam manner.

Among the treasures of the Soane Museum, in London, there are 53 ponderous volumes of original drawings from the drafting room of the Adams, purchased for the Museum in 1833 from the niece of William Adam, the youngest of the brothers. "These embrace a vast array of subject matter, from plans, exterior elevations, interior details of walls, ceilings, floors, etc., through the gamut of furniture, mantelpieces, grates fire irons, fenders, trophy cups, candlesticks, and lighting fixtures,—in fact every necessary and decorative item of the aristocratic home of the eighteenth century."

The plates included here present studies in color of ten ceilings sketched from the original Adam drawings. "It is of interest in passing to mention that some of the original drawings are finished with meticulous care, others are obviously hurried sketches to pin down a *parti*, with a color note added. Sometimes the plan is shown in the center of a drawing, with the elevations projected from the respective sides. The ceiling designs are usually drawn in diluted ink, often with the most amazing detail at a minute scale. Curiously enough, all the ceiling drawings are dated 1770-78. Inserts with compositions of the human figure are often of such skill as to suggest the hand of a miniature artist of long experience. Where figures are drawn less carefully there is the sure knowledge present of anatomy, draperies,

GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency anywhere in America even a few years ago.



Kensington Schoolhouse, Great Neck, N. Y.
Wesley Sherwood Bessell, Architect

THIS volume, a companion to another published in 1914, records the results of endless study and experiment in different parts of the country, summed up and presented. By illustrations of exteriors and interiors, by floor plans and carefully written descriptions and articles by well known architects and educators, the present high standard of schoolhouse design is made plain, and these results which have been achieved by a few architects and school boards are thus made possible to all architects who are interested in schoolhouse design. The compiler has selected from almost 1000 exteriors and floor plans the school buildings to be illustrated, and the volume records "a process of innovation and elimination, namely, the introduction from time to time of features which have been deemed desirable and practical, and the elimination of things which, owing to changed school methods, are no longer required."

400 pages; 7¾ x 10½ inches
Profusely Illustrated; Price \$10

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383 MADISON AVENUE NEW YORK

rhythm,—done with the facility of a miniaturist. Architectural ornament is no less exquisitely handled, although short cuts are so cleverly managed that the effect is the equivalent to modeling each subdivision, instead of having run a series of flat washes side by side, punctuated by dark accents. From hundreds of drawings equally beautiful and arresting, the difficulty of selecting only a few can be appreciated. The drawings reproduced here were chosen from the group of ceilings because they offered a more complete arrangement of a conception in its entirety than some other groups; as, say, the mantelpieces or furniture, which represent only a part of an entire room. From a cursory examination of the volumes it appears not unlikely that Adam may have studied the color scheme for a room in the ceiling design, as offering more uninterrupted area than would the walls.

"These ten sketches were selected from two viewpoints: first, to attempt to record some of the most characteristic schemes (if that be feasible in a few drawings out of hundreds), and second, to show also as wide a range in color schemes as possible. It was interesting to note the predominance of 'pastel' shades, difficult to approach with a water color palette, since the originals almost always had the appearance of being mixed with Chinese white. Because of the great care taken of the folios we were not permitted to work in close juxtaposition, but would mix a color on the edge of a piece of paper, and when it had thoroughly dried, compare it with the original. It was a matter of repeating this process until exactly the right note had been attained. The originals seem to have been run in thin washes, laid expertly with

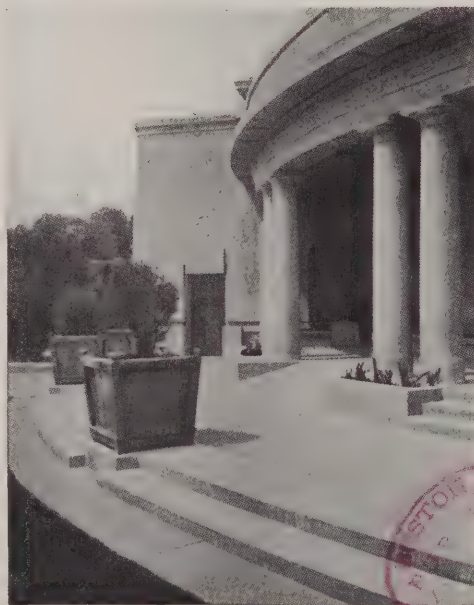
a very flat effect. A certain number of colors carry through many schemes, as the light green and pink for background colors, and the cerulean-turquoise blue in the small insert panels. In the accompanying drawings where the paper is left white, it is only because the originals were left so, apparently unfinished.

"Profound as was the influence of the Adam brothers in England, it has been almost more marked in America. Hotel and theater architecture has enthusiastically accepted their tradition with a proprietary air, unfortunately in too many instances without an intelligent appreciation of the refinements and scale which it involves. Our methods of buying quantities of stock motifs of varying sizes for the same ornament have popularized a style which should be termed anything rather than 'Adam.' To produce a genuinely Adamesque work entails more than mere reference to, and imitation of, documents on works by the Adam brothers, for theirs has an endless variety, evidenced by an ever-present mental agility to create a fitting treatment of the problem in hand. The modern designer too often feels that the reverse must be true,—that he must discover some occasion to flaunt a motif used by the Adams, rather than go to the sources from which they drew inspiration, and then, guided by a knowledge of Adam solutions, produce a work which is not a patchwork of book photographs. Perhaps no architect was ever less willing to repeat his own motifs without infinite search for better solutions and more fitting refinements, as he continued practicing, than Robert Adam. With what dismay, then, would he regard many American buildings which are attributed to his influence!"

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. "Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use."



are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States

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THE EDITOR'S FORUM

THE A. I. A. CONVENTION

THE MOBILIZATION of the Forces which make for Better Architecture," was the theme of the Sixty-first Convention of the American Institute of Architects, held in St. Louis, May 16, 17 and 18. The program of the convention was so arranged that the report of the Committee on Allied Arts was read by J. Monroe Hewlett, chairman, at the opening session. There were addresses by distinguished men, some of whom were not architects,—Walter S. Brewster, Royal Cortissoz (*in absentia*), Ferruccio Vitale, and Everett V. Meeks. Thereafter, the whole subject was placed before the delegates for the purpose of bringing out all shades of opinion and all points of view to the end that in the not distant future collaboration in the arts of design may be definitely encouraged and supported by the American Institute of Architects and its sister societies as the most important of all their activities. The work of the convention was accomplished with dispatch as all of the delegates were provided with printed copies of the Report of the Board of Directors and the Convention Reports of Standing and Special Committees. Discussions were pertinent and interesting, and prompt action was taken on the resolutions suggested by the Board of Directors accompanying the Report. "The Architect's Budget" was the vital subject of Edwin Bergstrom's address. An interesting address by Harry F. Cunningham officially opened the exhibition of the work of Bertram Grosvenor Goodhue. "Ideal Auditorium Acoustics" were discussed by Dr. F. R. Watson in an illustrated address. At one luncheon, O. C. Harn spoke of the work of the Producers' Council.

The results of the elections were announced at the meeting and reception at the City Art Museum, Friday evening, and two medals were awarded,—the Craftsmanship Medal to William D. Gates of Chicago, for work in faience, and the Fine Arts Medal posthumously to H. Siddons Mowbray, painter, after which the new President of the Institute, C. Herrick Hammond, of Chicago, was inducted into office. The officers elected were: *First Vice-president*, J. Monroe Hewlett; *Second Vice-president*, William A. Sayward; *Secretary*, Frank C. Baldwin; *Treasurer*, Edwin Bergstrom; *Directors*, Charles Butler, Charles D. Maginnis, Louis La Beaume.

The spirit and interest of the delegates, members and guests were evinced by the large attendance at all the sessions of the convention and each of the more informal gatherings. The gracious hospitality of the St. Louis Chapter contributed immeasurably to the success and enjoyment of the convention.

THE GOODHUE MEMORIAL

IN the past quarter-century no man has contributed as much to the development of American architecture as the late Bertram Grosvenor Goodhue. To perpetuate the memory of his great artistic and architectural genius, which has never before been equaled in this country, a group of his intimate friends are undertaking to erect a monument. To give an opportunity for all who are appreciative of his imperishable contribution to the architecture of this country to participate in creating this memorial, these paragraphs are reprinted from the leaflet which has been recently sent out by the committee in charge of this timely and worthy undertaking:

"In the architectural expansion which has been a peculiarly salient phenomenon in the recent history of the United States, Bertram Grosvenor Goodhue bore a leading part. To its development he brought the precious gifts of imagination and creative power. His genius was from the start imbued with the romantically aspiring beauty of Gothic. Some of his earliest designs were of 'dream fabrics' in which he recovered with extraordinary clairvoyance the distinctive quality of the style. That style was in his blood, and when he turned from dreams to realities he applied it in such buildings as St. Thomas' Church in New York, not as an alien thing, but as the natural expression of a personal ideal. In many beautiful buildings that ideal preserves his name today, and may well preserve it forever.

"When he died on April 23, 1924, a beacon light in American art went out. Also there passed a high minded, generous souled man, blithely valiant in spirit, in whom his friends rejoiced with tender appreciation,—for Goodhue was as lovable as he was admirable. A number of those friends have joined to do him honor, and they offer to others who knew him or his work the opportunity to share in a monumental tribute to his memory. This takes the form of a tomb, with a recumbent portrait statue, set in the east wall of the transept of the Chapel of the Intercession, at Broadway and 155th Street, in New York. The sculpture is the work and gift of Lee Lawrie, long associated with Goodhue in the embellishment of his buildings. The cost of the execution and installation of the monument is to be defrayed by subscriptions from those who, in the architectural profession and outside it, cherish the fame of a noble master builder. Subscriptions should be sent to the Bank of the Manhattan Company, Madison Avenue and 43rd Street, New York, and checks may be drawn to the order of the bank or to that of the Goodhue Memorial Committee."

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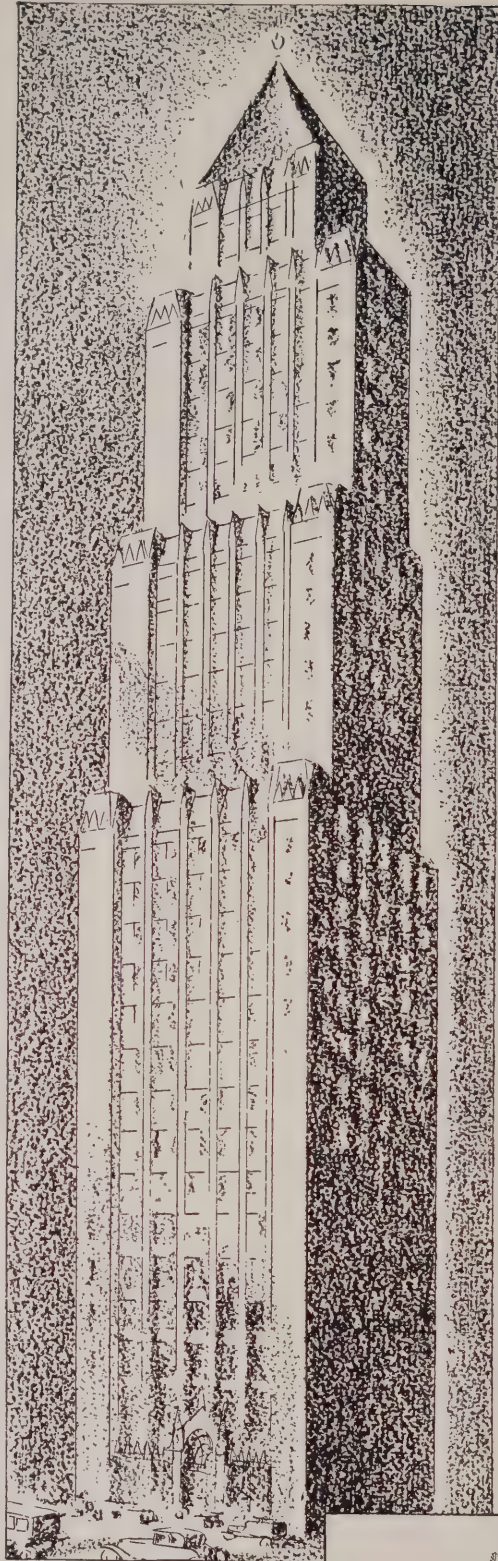
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CENTRAL UNION TRUST CO. BUILDING, NEW YORK

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

From a Rendering by Otto R. Eggers

THE ARCHITECTURAL FORUM

VOLUME XLVIII

JUNE 1928

NUMBER SIX



THE PROBLEM OF BUILDING A BANK

BY

PHILIP SAWYER

OF THE FIRM OF YORK & SAWYER, ARCHITECTS

IN 1905 and in 1921 and again in 1923 I attempted to write an article on this subject of banks. During the interval between the first and last of these articles there was, of course, something new to say, as bank architecture in this country had undergone great changes and developments. In the last five years, the problem has remained much the same except that our building units are gradually becoming larger and a bank is more likely than heretofore to occupy a comparatively small proportionate area of the whole structure. An article written now, therefore, from the same point of view,—that is the architect's,—would tend to be a *resume* of the same material. It occurs to me, therefore, that perhaps it might be as well to treat the whole subject from the client's viewpoint. A few years ago there was a story that one man at a club remarked to another: "I don't understand this business of using the earth as a return for radio stations and dispensing with *antennae*." To which the other replied: "Why it's perfectly simple. Instead of not stringing the wires that they don't need overhead, they don't lay the conduit that they don't have to have underground." The former articles were written for the architects who, of course, never read them. This is written for the clients who are still less likely to develop the slightest interest in the subject, and who seldom see an architectural magazine unless they are loaned a copy by an architect whose work is illustrated therein. The question of who doesn't read the article is therefore academic, but it is understood that pictures must be garnished by a certain amount of letterpress to form a background or a surround for the illustrations, though the illustrations are of paramount importance.

Nowadays an architect is frequently selected not by the banker but by the builder or promoter, or in fact by anyone else who has the idea of relieving the pressure on a certain crowded bank and at the same time cashing in on a valuable site. There are still, however, sporadic instances where a bank itself actually determines to build and goes about the selection of an architect with care and system. Recently such an institution sent one of its officers with its own architect, who takes general care of all its building operations from Paris and London to Bogotá and Vancouver, on a trip through the United States, to look at all the bank buildings which appealed to them and particularly to ascertain from the organizations themselves how accurately the

architects had been able to provide for their activities, effect economies in their administration, running expenses and overhead, and particularly to foresee and provide for their development and growth. They went to Boston, to New York, as far south as New Orleans, and as far west as Chicago and Louisville. They returned with a definite recommendation of the firm which seemed to them to have produced the most practical buildings and to have left behind most uniformly satisfied clients. This firm they recommended as "the least worst." Let us suppose that the architect is selected in some such intelligent and thoughtful way and not merely because he has built some prominent buildings which may or may not work, or because he has married our favorite aunt or possibly because he belongs to the same golf club!

The next question is, what does the architect do with the project? A client visiting an office here recently was amazed to find some 30 experienced men, each engaged upon a uniform-sized sheet, 2 feet by 4, and to be told that there would be 104 such sheets in the contract set, each of which would take, merely for the final drafting, after everything in the design and construction had been thoroughly established, about three weeks' time to make. He was also shown the folders of preliminary drawings, innumerable studies and sketches on tracing paper, which preceded this final stage. But it was of course impossible to convey to him any conception of the effort and expense which had gone to produce the final design. Let us begin at the beginning. The architect has, in preparing his contract with the bank, given his client the choice of paying the architect's percentage and of paying separately the fees of the engineers for (1) foundations; (2) heating and ventilating; (3) electrical work,—or of paying the architect an increased percentage covering these items and requiring the architect to employ and pay the engineers himself. In any case, the client has probably seen the wisdom of hiring an equipment engineer to make the preliminary studies of his organization, and of typical working layouts for all his departments, and to design, detail, specify and contract for all special equipment, besides planning the equipment behind the counter screen, including every item of working furniture down to receptacles for ledgers, the style of buses and details of files and cash drawers. The bank has thus relieved itself of the undertaking.

In either case the client will save a proportion and



Photos. Richard Southall Grant

General View



Public Lobby

First National Bank, Boston

York & Sawyer, Architects



Officers' Space

probably the whole of the fees paid, since he will get bids on uniform drawings and specifications, obtain real competition, and receive comparable figures instead of being obliged to make comparison among a dozen offerings of heterogeneous material, each of a different manufacturer's design, the actual relative value of which it is impossible for him to determine. In either case the architect now recommends to the client the various engineers to be employed, and they are decided upon at once. It may be that the foundations present no difficulty, in which case they are handled by the architect's office. Possibly it is a simple project, and the architect designs the heating and ventilation and electric work. But in an undertaking of importance it is real economy to employ the engineers mentioned, since no architect can afford to have continuously in his employ, or to give such complete, all-round experience to these men as they are able to acquire practicing independently and covering exclusively their own subjects. The architect begins, therefore, by making, with the equipment engineer, a thorough survey of the existing organization of the bank; he studies diagrammatically, without regard to limitations of site, cost, or construction, the problem presented by the housing of the bank's organization; and he endeavors to foresee and to provide for its anticipated growth. This last is, of course, the most difficult item of all, and it is here that the wise architect shows an optimism which the banker, always apparently pessimistic, regards as



Photos, Kenneth Clark

Main Lobby



Maiden Lane Facade

Federal Reserve Bank, New York
York & Sawyer, Architects

extravagant, but in which, nevertheless, the architect generally proves to be right. In the past 30 years an allowance for growth of as much as 250 per cent has sometimes been provided, the assumption on the part of the bank being that it was taking care of the next 20 years' growth. None of these institutions has failed to expand beyond its anticipated bounds in less than ten years. For it is, of course, the active bank which builds, just as it is the active bank that grows.

The problem of providing for future growth is a stumper. We used to be told that national banks grew at the rate of 6 per cent a year, which means that a bank should double its resources in, say, 12 years. In 15 years from 1910 to 1925 national bank resources increased 146 per cent, an actual rate of growth of 6.2 per cent a year, or, flat, of 9.7 per cent a year, doubling in 10 or 11 years. Resources of trust companies during the same period increased 174 per cent, and those of savings banks 123 per cent. During the previous 15 years, from the depression of 1895 on, including the drop in 1898, the average rate of increase for all banks was 7.5 per cent. In a chart showing such growth, there is a dip between 1875 and '80, the rise is fairly constant until the acceleration between 1915 and '20, and then a decided drop, followed by the present recovery. The rate now is about the same as before the war. These figures are given to emphasize the fact that when a banker says largely, and it is the natural thing: "We'll provide for double our present



Screen in Entrance Lobby



PUBLIC SPACE



WINDOW DETAIL



ENTRANCE DETAIL

FEDERAL RESERVE BANK, NEW YORK
YORK & SAWYER, ARCHITECTS



GENERAL VIEW



ENTRANCE DETAIL

Photos. Mattie Edwards Hewitt

BANKING ROOM

THE GREENWICH SAVINGS BANK, NEW YORK
YORK & SAWYER, ARCHITECTS



Entrance Detail



Banking Room

Central Savings Bank, New York
York & Sawyer, Architects

capacity;—we don't want to make another shift for 25 years," he is not being so gorgeously liberal as he imagines, because he is probably not providing for quite half that period. Nor is he anticipating a possible merger or consolidation which may tax his building to its utmost, and which, alas, often occurs just too late to make proper plans for expansion!

Rent is, after all, a very small proportion of the total expense of a bank, and simplifications effected in operation and administration by a compact and logical working plan may often reflect economies which make any differences in rent negligible. Having made a thorough study of the organization of the bank, the space requirements of its units, its personnel, and the inter-relation of its departments, and having adopted an assumption of the growth to be provided for, actual counts are made, over a sufficient period of time to establish an average, of the number of public contacts made by each division and to determine the frequency, importance and character of their inter-communications. This material is digested, reams of small scale sketches are prepared in the attempt to fix upon paper all this data, first without regard to physical limitations and later to meet the specific requirements of the lot, the volume of the building under the zoning law,—if there is one,—and the limitations of construction

and of cost. When a workable scheme, represented in diagrammatic plans, sketches and block elevations, proves itself feasible, an accurate financial statement is prepared showing, (1) the total investment, including rent, building fees and not omitting taxes and carrying charges during the period of construction; (2) annual expenses, including all interest charges, amortization, taxes and ground rent, if any; (3), annual income from any portion of the building rented to tenants, and as a result, the amount which remains to be charged against the bank as rent. If several schemes are under consideration, such statements as I have outlined are prepared for each one, together with a careful mathematical analysis of the proportion of "light" rentable area,—that is area not more than 25 feet deep and directly opposite an outside lighted wall, all other floor space being assumed to be "dark,"—in proportion to the total cube of the building, enabling a wise decision to be made upon actual facts instead of on vague assumptions. In the most economical types of office buildings, competently planned, there should be not more than 16 cubic feet to be paid for by the owner originally in order to obtain one square foot of "light rentable area." Of course this will not apply to that portion of the building occupied by a banking room say 50 feet in height, and in a monumental building



General View

The Royal Bank of Canada, Montreal
York & Sawyer, Architects



Washington Trust Co., Westerly, R. I.
York & Sawyer, Architects



Entrance Lobby

it may be necessary to increase this proportion to some slight extent even on the typical office floors. But the proportion of 1:16 should be adhered to as closely as possible, since if, for example, it should work out 1:20 it is obvious that this building is operating under a 20 per cent handicap in competition with an ideally efficient neighbor and must therefore have sufficient advantage in location, character or prestige to charge 20 per cent more rent or, at the same rent, to suffer a corresponding diminution in its return on the investment, and this has to be considered.

Much depends during this preliminary work upon the coöperation of the client. The bigger and busier the man at the head of the bank, the more likely he is to appreciate the importance of this fundamental work and either to give it his personal attention or to depute for that purpose competent representatives. The closer the connection between the bank and its architect during this period, the quicker the matter will proceed and the more satisfactory the final results. Where weekly meetings are held at the architect's office and the whole work reviewed constantly, it is impossible to go far wrong and, with the least lost motion a scheme is reported to the building committee with all the data necessary to enable it to arrive at a wise decision. Upon the approval of

these preliminary drawings by the bank, the architect proceeds to study at small scale with the structural and mechanical engineers the steel, heating and ventilating, plumbing and lighting. It is at this point that he determines the type of floor construction to be used; locates his vent shafts and pipe chases, and works out the elevators, which present nowadays a complicated problem in any city where zoning laws are in force. Not long ago one could take the area of a uniform floor and, assuming a density of occupancy, tell at once the number of elevators to be provided. Now, where each setback proportionately reduces the area, where buildings are of great height and are served by a number of "banks" of cars stopping at different levels, it is not so simple. But the net result must be that a man entering the building and just missing an elevator shall not wait for the next car longer than a certain interval, which in New York is usually assumed to be 25 seconds. The considerations just mentioned may modify to a certain extent the original drawings, but if the conditions have been properly foreseen, these differences will be unimportant. The bank now authorizes working drawings. These are prepared at a larger scale, on cloth, and are accompanied by all the details, at still larger scale, which it is desirable to have in the



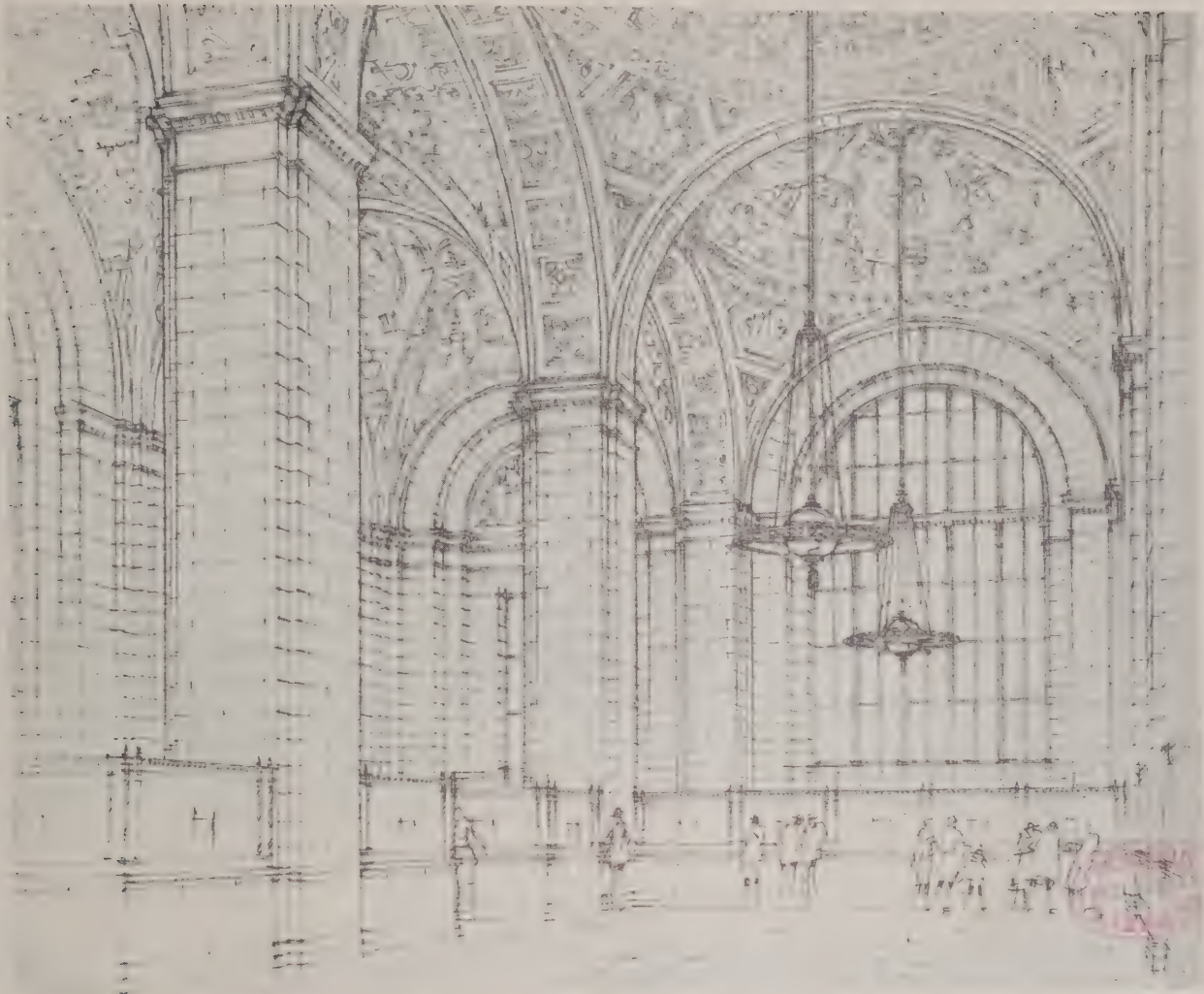
Preliminary Studies, Canadian Bank of Commerce, Toronto
 Darling & Pearson, Architects; York & Sawyer, Consulting Architects

hands of the contractors in order to obtain the closest estimates. At the same time specifications are outlined by the architect himself as regards fundamental uses of materials, and as the working drawings and specifications are developed, the same weekly meetings of the bank representatives and architect determine in detail all questions which may come up regarding the extent to which mechanical ventilation shall be used, for example; the character of the vault work; the materials to be employed and the finish of the various parts of the structure.

There are, in general, two ways of engaging a contractor. Nowadays the bank frequently chooses a firm in which it has confidence and agrees to pay it the actual cost of the work, plus either a percentage fee or a fixed sum which will cover its own office costs and profit. It is often argued that this method precludes competition. In reality it means that the general contractor is paid his actual cost on that portion of the work which he performs himself (usually the masonry), but that the excavation, foundations, steel, elevators, and in fact contracts of all other trades are let in competition upon bids obtained by the general contractor and submitted to the building committee and to the architect. This arrangement has the great advantage that

the builder is acting professionally as the adviser of the owner, that his interests are identical with the bank's, and particularly that he may be appointed at the inception of the project and called upon for advice and for preliminary estimates during its early stages. The second method is to wait some months until the architect has had time to complete working drawings and specifications, and then to obtain competitive bids from a number of general contractors, selecting the one whose bid seems most desirable in consideration of his ability and reputation. In this case such bids are opened at a meeting of the building committee, the general figures, as well as any alternates, being listed on bid sheets prepared by the architects, consideration also being given to the character of the sub-contractors listed by the firms bidding as those whom they propose to use.

A number of men are assigned to the checking of contractors' drawings. One of the first details is to check each piece of steel that goes into the supporting frame. At the same time the stone contractor's details for each block of stone in the exterior wall are checked, as are also the windows, spandrels, and any other work to be built into the masonry during construction. The care taken in the architect's office to lay this stonework so that estimates upon it



Preliminary Study, Canadian Bank of Commerce, Toronto
Darling & Pearson, Architects; York & Sawyer, Consulting Architects

may be accurate, errors avoided, and each block come to the building ready for its appointed place, would probably seem to the client excessive. Each block of stone, which has already been indicated many times in preliminary drawings, is shown in the contract drawings, in plan, elevation, and section. It is again shown in its three dimensions on the $\frac{3}{4}$ -inch scale drawings. If it has any mouldings on it, these are drawn full size. If these mouldings are important or if they are ornamented, there is a full-sized model of them. The stone contractor also draws each stone in plan, elevation and section on his setting plans, and usually there is an isometric perspective on a card which goes to the cutter. Each stone has therefore been drawn from a dozen to 20 times, and checked between the architect's drawings and the setting plans before it arrives at the building. There should be very little cutting on the site unless some slight error has occurred between the checking of the steel and stone. During this initial period of construction, plaster models have been prepared, sometimes, first, at small scale and later usually at full size for all ornamental work. This includes carved stone, exterior ornamental iron, interior plas-

ter, the bronze work of doors, cages, check desks, screens,—in short for all elements in building which are sufficiently important and where it is impossible to determine them satisfactorily on paper. If it is possible to have all these models made by a single firm, the best results should be obtained. The moment that the construction is out of the way and the details of the shell of the building established, the banking room, board room and all spaces requiring special treatment, are drawn out at larger scale, full-sized details are made, and the scheme of decoration, furniture, rugs and lighting fixtures determined, the architect in many cases preparing detailed drawings for important furniture, and cartoons for the design of the rugs. Sketches for the lighting fixtures are carried forward far enough to enable competitive bids to be taken on them.

The architect's inspection of the building begins with the demolition of any structures on the property, follows through the excavation, foundation work, and the construction of the steel and the masonry. No matter how careful and accurate the drawings and specifications may be, questions are bound to come up which he has to settle "in the



Entrance Detail



General View

First National Bank of Boston, Buenos Aires
Chambers & Thomas, Architects; York & Sawyer, Consulting Architects



Photo. Sigurd Fischer

Washington Trust Co., Westerly, R. I.
York & Sawyer, Architects

field." Although all the work of the mechanical trades, pipe chases, ventilating ducts, and plumbing pipes, have been checked with the architectural drawings, minor adjustments are likely to prove necessary. The architect now begins his visits to the quarry where he selects the stone; the sheds where it is cut and carved; the foundries where the bronze is cast; the shops where wrought iron is prepared and where the vault work, furniture and equipment are being built. In the case of one bank, the builder in going over the quarries in Indiana was enabled to select the "grout," the refuse, good stone being discarded because of varieties in color outside of the old fashioned classification,—and by accepting any sound stone without regard to texture, color, or any imperfection not impairing its soundness, it was possible to obtain for a charge little more than the freight a quantity of stone already quarried which made not only the cheapest but one of the most effective stone walls imaginable. Since that visit the 35 per cent of "discards" has vanished; there is no waste in Indiana, and the material formerly discarded has become "our antique Gothic" and commands a higher price than perfect stone. "Fine," said one old Scotch quarryman to his partner; "this is the archytect we've been lookin' for for 20 years. I'd like to kiss him." And returning from this visit, the working drawings for the bank's walls, nearly 1000 feet in length, were redrawn, some 70,000 cubic feet of stone eliminated, and over



Photos. Sigurd Fischer

Exterior View



Banking Room

First Bank and Trust Co., Utica
York & Sawyer, Architects

\$300,000 saved to the bank,—at an additional drafting expense to the architect, it is fair to add, of some thousands of dollars.

Following the financial statement already spoken of, the architect will have prepared, with the contractor, a detailed budget of the general contractor's work, and that of the hundred or more sub-contractors who are nowadays required to make a completed building. He will have added to these items the allowance made for miscellaneous material such as equipment, furniture, rugs and hangings, and in a complete statement he will include the last items down to waste baskets, blotting pads, match holders, paper cutters and calendars. These may all be specially designed, if required, and decorated with the seal or insignia of the bank. It is impossible to indicate every detail of the work necessary on the part of the architect to produce a satisfactory result. For instance, suppose there is over a window a keystone surmounted by a head such as those in the University Club of New York or The Royal Bank of Canada. This will have been drawn a number of times in the preliminary drawings until its proper weight and scale have been satisfactorily determined. It will then be incorporated in the small scale elevations, studied at three-quarter scale, which is three times that size, and then full-sized drawings will be made, rendered in soft pencil or charcoal. From these drawings the stone in the cutting shed will be "boasted,"—that is, roughly cut to allow sufficient



Dime Savings Bank, Waterbury, Conn.
York & Sawyer, Architects

volume,—and a model will be made at full size for the carver. A particularly competent carver will be selected from among men working on the building, and the architect will follow closely the actual work. Endless care is necessary from start to finish if the result is to be acceptable. Take such an item as the board room. It has been studied at small scale and shown on the contract drawings. Larger details are then made at three times this size, and color studies are prepared in collaboration with the decorator. Full-sized details are drawn of every moulding in the woodwork, of the floor, if it involves marble borders or mosaic, and of the ceiling if it is ornamented. Shop drawings for this woodwork and for the stone or marble floor are checked. Rugs are cartooned, “tufts” selected for color, and samples are manufactured. Curtain stuff is decided upon, and the hangings are designed. Lighting fixtures are drawn or selected, and samples are approved for the finish of the woodwork. The ceiling tones and all the elements of the color scheme are assembled

for final determination at the building. This wearisome list is a fragmentary indication of the care and drudgery necessary to turn out acceptable work. In doing it the wise architect will disregard his own costs, since his success depends not upon the percentage of profit upon any single structure, but upon producing continuously a series of buildings each of which will demonstrate annually the convenience of its arrangement, economy of its upkeep and, last, its artistic merit which may appeal to the bank's clients.

Henry Wotton, Knight, writing in 1624, follows his dedication to Charles, Prince of Wales, with this opening: “In architecture as in all other Operative Arts; the end must direct the Operation. The end is to build well. Well building hath three Conditions: Commoditie, Firmeries and Delight!” And Isaac Ware, Esquire, of His Majesty's Board of Works, 1756, says in his preface: “. . . nor shall we fear to say that the art of building cannot be more grand than it is useful; nor its dignity a greater praise than its convenience.”



Photo. Sigurd Fischer

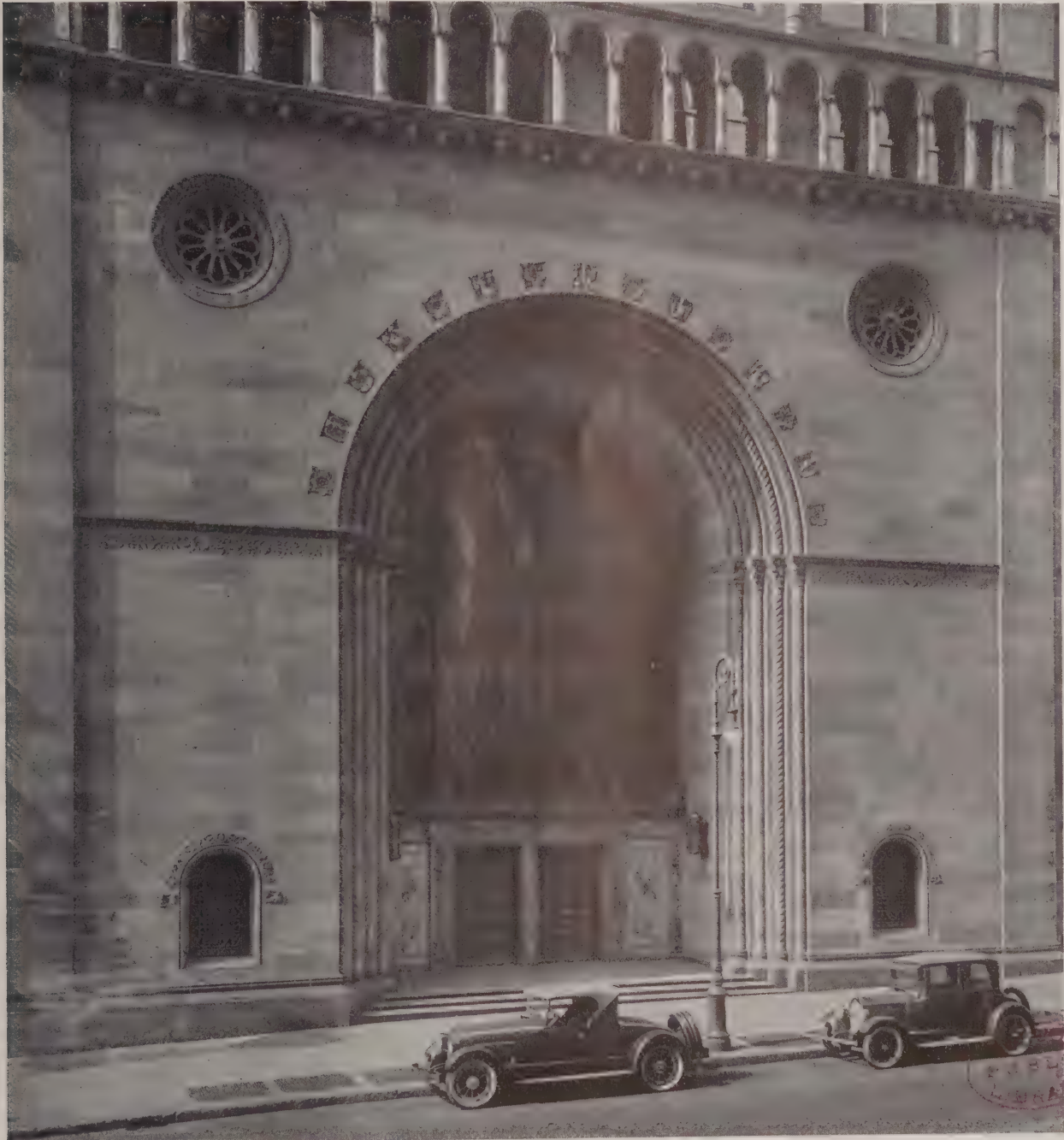
Dime Savings Bank, Waterbury, Conn.
York & Sawyer, Architects

THE BOWERY SAVINGS BANK

BY
CHARLES G. LORING

THE differences real or imaginary, or rather the differences in reality and imagination, between New York and Boston are expressed in their bank buildings. A score of years ago the metropolitan banks expressed wealth and those of New England security,—an imperial, Roman wealth and a puritanical security. Both motives were appropriate, and each motive was a bona fide visualization of the banking ideals of the community. When architectural orders were used, the Corinthian typified

luxury, and the Greek Doric typified solidity. What happened a score of years ago is out of date now; progress or acceleration, imagination or eclecticism, demands "something different," and the nineteen twenties are landmarked by the Bowery Savings Bank in New York and the Old Colony Trust Company in Boston. The first proclaims the beauties of wealth, the second commends the romance of traffic. Each is a step away from the conventional banking house, and each has pronounced individuality.



Bowery Savings Bank, New York
York & Sawyer, Architects



Portion of Main Banking Room

What happened a score of years ago in design is as out of date now as are the architectural criticisms of that time. The H. H. Richardsonian Romanesque was in dire disrepute; the proclamations of the preceding generation that it was the first real embodiment of the American style were forgotten. Such translations of Romanesque were abandoned because deep window reveals were impractical in an office building, since the expression of massive stone construction belied the age of steel, because it was a one-man style and would never reappear. Today there must be laughter in Parnassus when the architectural journals arrive;—but for a change in handwriting, a slight attenuation in detail, a softening of the color scheme, the exterior of the Bowery Savings Bank might have been evolved by the elder Richardson! Twenty years from now will this basilica under a hive of offices represent post-war New York? Will it represent a savings bank? Not to many, but to quote from "Hill's Rhetoric," it has unity, mass and coherence, and it is deemed so original that already it is being widely copied.

The 42nd Street home of the Bowery Savings Bank is not on the old, downtown highway, where "they do such things and they say such things"; in fact it will "never go there any more," nor does it recall the Knickerbocker Dutch of the Bouwerie. Instead it is a superb and tessellated hall, an Italian Romanesque temple to the god of money, set at the



Exterior of Main Entrance, Bowery Savings Bank, New York

York & Sawyer, Architects.

focal point where more varied lines of traffic converge at more super-imposed levels than anywhere else on this spinning globe. It does not recall the corporation's past,—it bespeaks the bank's future.

The god who is served in this hall is a deity austere, omnipresent and grown great by watchfulness of little things. The enormous height, the bituminous dimness, the exquisitely aloof beauty, the minute doorways beside and below the triumphal arch of the two windows, half a hundred feet high, echo the solemn chant of "Every little bit added to what you've got makes just a little bit more." There are nearly two hundred thousand depositors in this mutual bank, and each one as he enters can say: "This was built for me; herein am I privileged." As he pauses before the little leather-covered chest, the original depository of 1834, now arked in crystal and set like a shrine with its saint's ossuary, he repeats to himself the ritual: "Behold what a great oak has grown from this little acorn!" Here is a temple in which to meditate on beauty, coöperation, and the insignificance of the individual.

The scale of the interior visualizes the dreams of the statisticians. "If all the nickels deposited in this bank were piled one upon the other, they would form a shaft reaching from the subway to Olympia. Each fragment of mosaic, each block of polished marble, each slab of travertine, represents a stone not left unturned by a depositor in this bank."



Detail in Main Banking Room



Interior of Entrance Vestibule, Bowery Savings Bank, New York
York & Sawyer, Architects

Around the exterior portals there is symbolism to encourage the true believer. Messrs. York & Sawyer and Mr. Ricci have boldly composed figures of Industry and Security attended by the nut-gathering squirrel, the wise owl, the watchful dog, the self-sacrificing pelican, the busy bee, the crafty fox and, —unless the execution is not legible—the boar or pig. Among the Byzantine foliage nestle coins, cog wheels, hour glasses, treasure chests, scrolls of accounts, and a highly conventionalized “%.” Within the bronze gates, raised at a respectful distance, is the triforium screen with a hierarchy of 21 squat immortal penny-savers in pierced levanto. The very material suggests the skill of the Levantine Greeks, and it is supposed that the group of patrons includes Ben Franklin gaining a penny, Midas touching gold, Peter Stuyvesant real-estating with the Indians, Dame Opportunity knocking at the door, and Hetty Green.

The architects were given full command; theirs not to worry about cost per cubic foot nor the introduction of a mezzanine floor for clerical space; they were welcome to determine the height of the banking room best suited to the floor area, and behold they merit well from the public! They could choose what style they pleased, and any illuminated debater on the arts could, with equal logic, condemn or

praise their choice. They had an ample budget and, presto, signed a cost-plus contract on a falling market. Fortune allowed them to mullion the Titan windows in bronze at the original estimated cost of iron, and the saving in paint and replacement will, so it is said, pay for the bronze in a score of years; and a stone interior of course requires no upkeep,—it typifies economy. No wonder the happy authors sang the song of savings in the walls and floors and counters, using the richest of all conceivably rich marbles. It is all so elegantly superlative that symbolism finds its last expressive bit in the reveals of the interior arches, where the toiling depositor can gaze on centaurs, hippogriffs, Pegasus and gleesome lions with foliated tails. Here is a castle in the clouds brought to earth, and the ticket of admission is only a stiff little deposit book.

Some small-townners, some conservatives have carped at the building's grandiloquence and extravagance, but on authority it is reported that the architects are satisfied, and the board of governors is satisfied; they have their building and they have their free advertising, and the depositors are satisfied; they get their interest both in cash and in beauty, and even the man in the street (there is usually one man in the street with a *flair* for architecture) is satisfied. “And that,” said John, “is that.”



Interior, Bowery Savings Bank, New York
York & Sawyer, Architects



GENERAL VIEW



Photos. Miles Berne

BANKING ROOM

Plan on Back

BRANCH OF SECURITY TRUST AND SAVINGS BANK, COMPTON, CAL.
A. C. ZIMMERMAN AND RUDOLPH MEIER, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction. Steel frame; brick exterior walls; partitions of wood, metal lath, and plaster.

Exterior Material. Indiana limestone.

Windows. Wood.

Counter Screens. Marble and bronze.

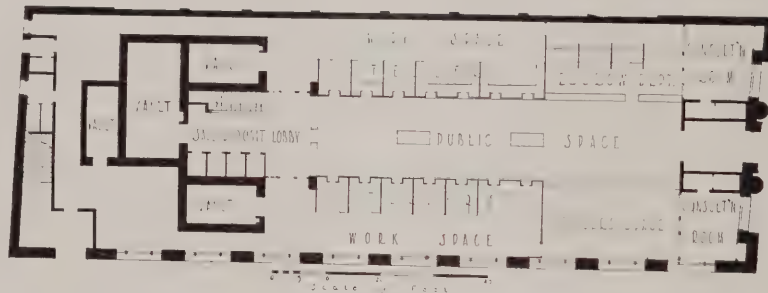
Type of Lighting. Direct.

Heating. Gas, steam radiation.

Date of Contract. July 9, 1923.

Total Cost of Building. \$131,000.

Cubic Foot Cost. 42.5 cents.



PLAN, BRANCH OF SECURITY TRUST AND SAVINGS BANK, COMPTON, CAL.

A. C. ZIMMERMAN AND RUDOLPH MEIER, ARCHITECTS





ENTRANCE FACADE

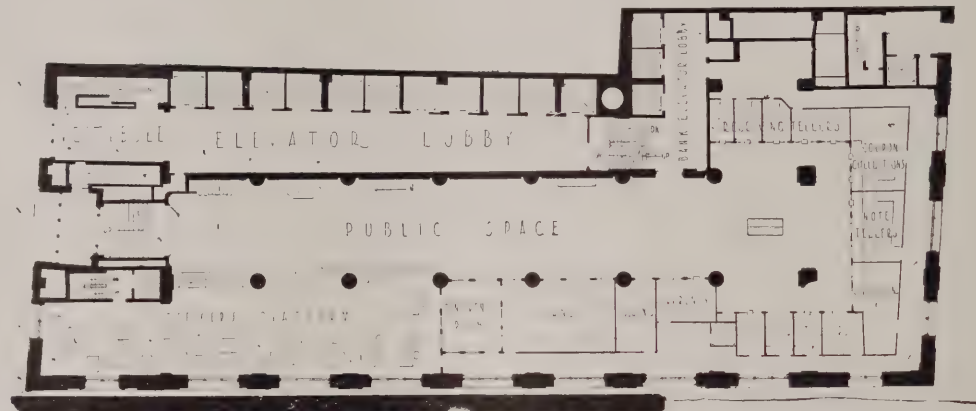


Plans on Back

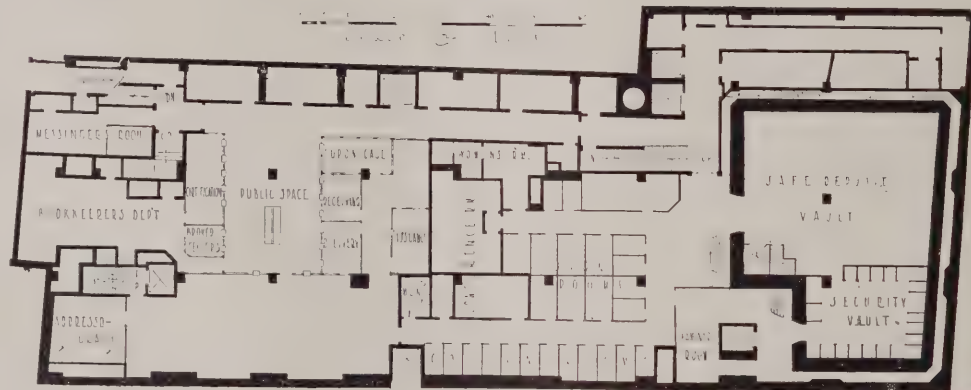
PUBLIC LOBBY
BANK OF AMERICA, NEW YORK
TROWBRIDGE & LIVINGSTON, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction. Fireproof.
 Exterior Materials. Limestone and brick.
 Interior Materials. Marble in banking quarters.
 Windows. Steel.
 Counter Screens. Marble, bronze and iron.
 Vault and Safe Deposit Provision. Two-story vault.
 Type of Lighting. Direct.
 Year of Contract. 1924.
 Cubic Foot Cost. 67 cents, including bank equipment.



FIRST FLOOR



BASEMENT

PLANS, BANK OF AMERICA, NEW YORK
 TROWBRIDGE & LIVINGSTON, ARCHITECTS





Plan on Back

BANKING ROOM

MECHANICS SAVINGS BANK, HARTFORD
BENJAMIN WISTAR MORRIS, ARCHITECT



FRONT ELEVATION

COST AND CONSTRUCTION DATA

Type of Construction: Reinforced concrete,—
"tin pan" type.

Exterior Materials: Granite facade.

Interior Materials: Marble, bronze, plaster, wood.
Windows: Steel.

Counter Screens: Marble and bronze.

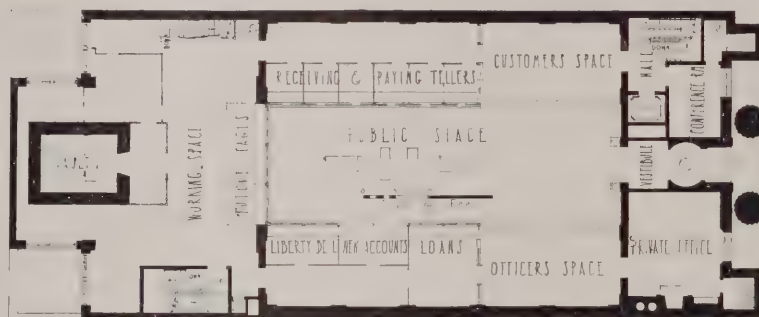
Vault and Safe Deposit Provision: Bank vault
only.

Type of Lighting: Direct and semi-indirect.

Heating and Ventilating: Steam heat. Forced
ventilation, supply and exhaust system.

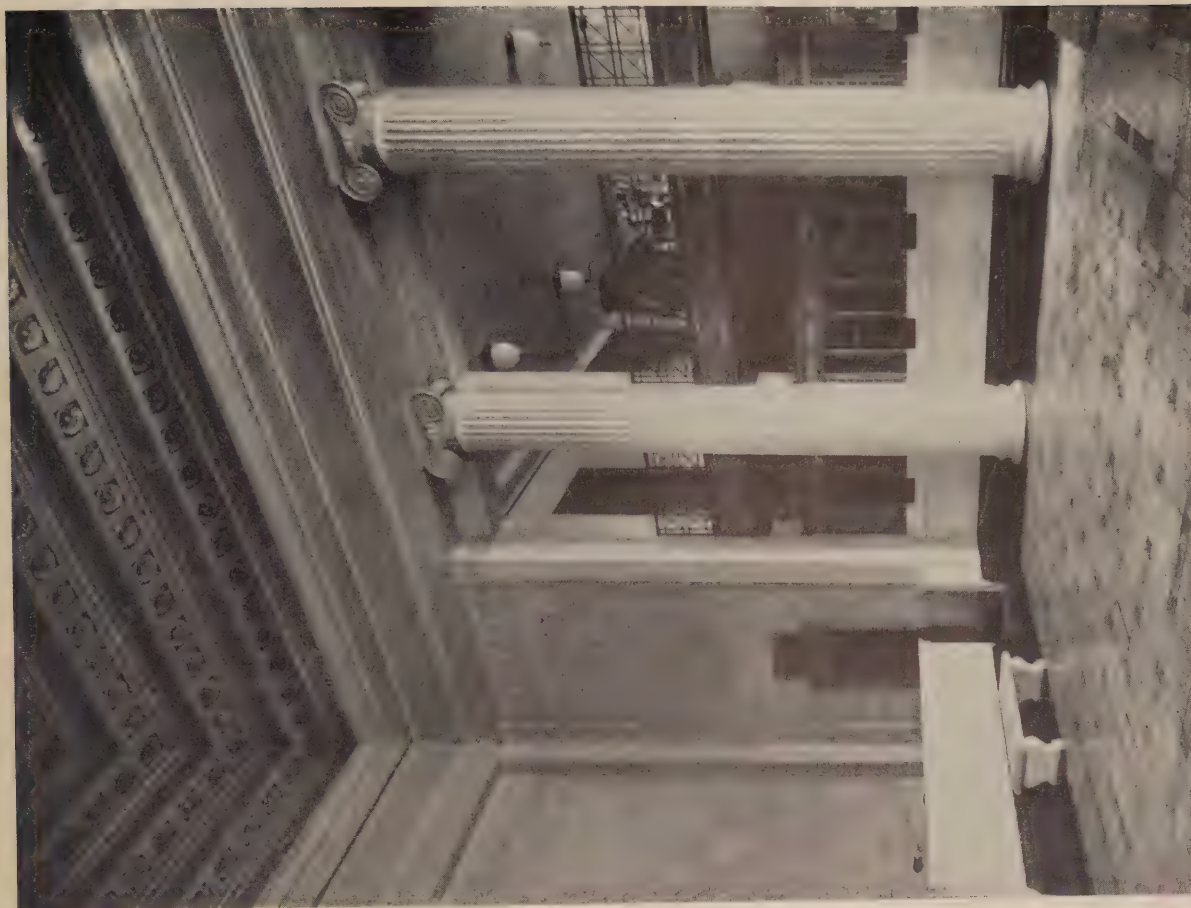
Date of Contract: November, 1923.

Cubic Foot Cost: \$1.18.



PLAN, MECHANICS SAVINGS BANK, HARTFORD
BENJAMIN WISTAR MORRIS, ARCHITECT





Plan on Back

CORNER OF BANKING ROOM
BRANCH, FEDERAL RESERVE BANK OF ATLANTA, BIRMINGHAM
WARREN, KNIGHT & DAVIS, ARCHITECTS



GENERAL VIEW

Photos. Tebbs & Knell, Inc.

COST AND CONSTRUCTION DATA

Type of Construction. Reinforced concrete; steel roof.

Exterior Materials. Brick and granite.

Interior Materials. Marble, bronze, plaster.

Windows. Steel.

Counter Screens. Bronze and marble.

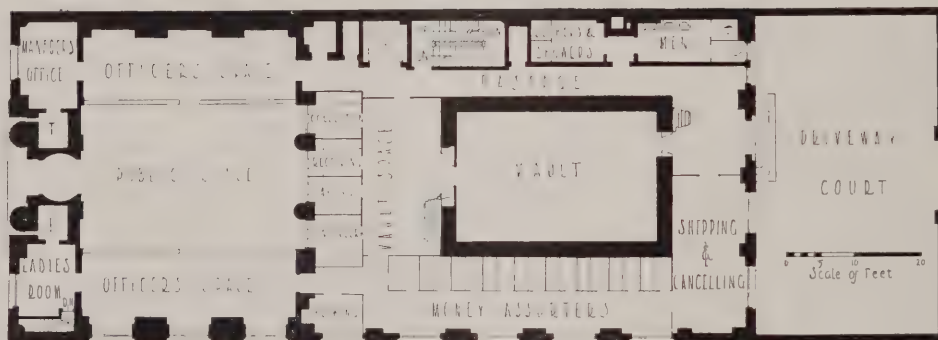
Type of Lighting. Main banking room, indirect lighting; office and work space, direct light units.

Heating and Ventilating. Mechanical ventilation and direct radiators.

Year of Contract. 1925.

Total Building Cost. \$340,000.

Cubic Foot Cost. \$1.



PLAN, BIRMINGHAM BRANCH, FEDERAL RESERVE BANK

WARREN, KNIGHT & DAVIS, ARCHITECTS





Photos. Pringle & Booth

BANKING ROOM

THE BANK OF NOVA SCOTIA, OTTAWA
JOHN M. LYLE, ARCHITECT



FRONT ELEVATION

Plan on Back

COST AND CONSTRUCTION DATA

Type of Construction. Steel frame; reinforced concrete floors.

Exterior Material. Indiana limestone.

Interior Materials. Marble walls and trim, and pink marble floors. Upper walls of cast Caen stone, with plaster ceiling.

Windows. Bronze.

Counter Screens. Marble and bronze.

Vault and Safe Deposit Provision. Island type vault of heavily armored concrete lined with special steel linings in several thicknesses.

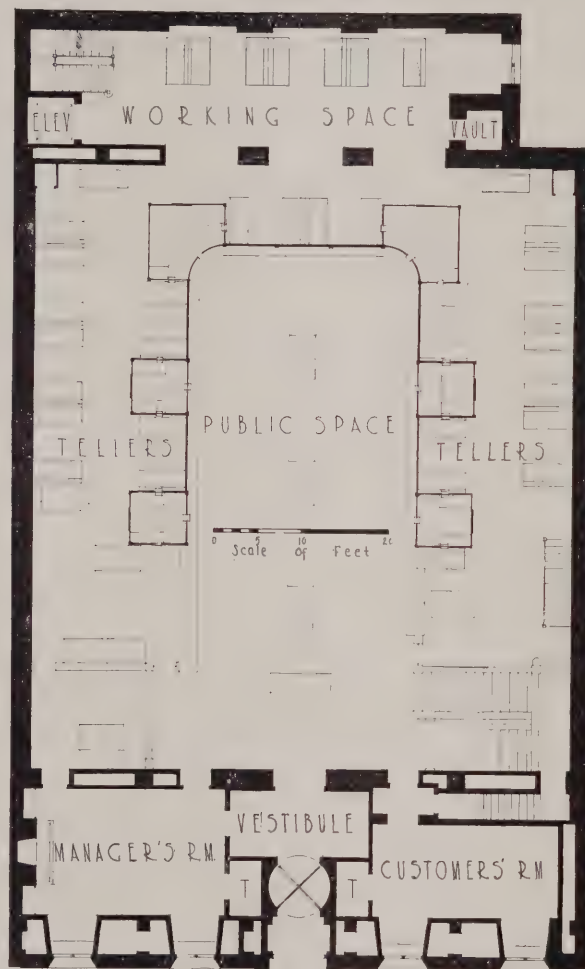
Type of Lighting. Direct.

Heating and Ventilating. Low-pressure steam; direct radiation, with supply and exhaust ventilation.

Date of Contract. September, 1923.

Total Building Cost. \$332,286.39.

Cubic Foot Cost. 73 cents.



PLAN, THE BANK OF NOVA SCOTIA, OTTAWA
JOHN M. LYLE, ARCHITECT



Photos, J. C. Mangous

BANKING ROOM

THE PUTNAM TRUST COMPANY, GREENWICH, CONN.
MORGAN, FRENCH & CO., INC., ARCHITECTS



GENERAL VIEW

Plan on Back

COST AND CONSTRUCTION DATA

Type of Construction. Fireproof, excepting roof.

Exterior Materials. Granite base; remainder buff Indiana limestone.

Interior Materials. Plastered walls and ornamental ceilings. Walls in imitation of Caen stone. Mahogany cabinet work. Tavernelle marble wainscoting for officers' space railings, etc. Travertine floor in public space.

Windows. Steel casement sash.

Counter Screens. Tavernelle marble.

Vault and Safe Deposit Provision. Combination fund and safe deposit vault in basement, with 16-inch emergency door; refrigerated fur storage vault with capacity for 4,000 garments; large storage vault for silver and other bulky materials.

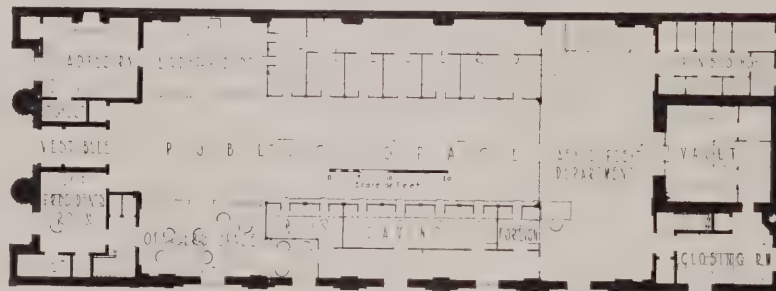
Type of Lighting. Direct.

Heating. Two-pipe, low-pressure steam.

Date of Contract. July 2, 1925.

Total Building Cost. \$278,570 for building and equipment.

Cubic Foot Cost. 42.5 cents, based on construction cost of \$168,370.



PLAN, THE PUTNAM TRUST COMPANY, GREENWICH, CONN.

MORGAN FRENCH & CO., INC., ARCHITECTS





STREET FACADE



Photos. Padilla Co.

Plan on Back

GENERAL BANKING ROOM
CALIFORNIA SECURITY LOAN CORPORATION, PASADENA
WALLACE NEFF, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction. Reinforced concrete, with tile roof.

Exterior Materials. Stucco with handmade tile.

Interior Materials. Plaster, with colored tile and woodwork of pine with walnut finish.

Windows. Wire glass in metal sash and frames, and plate glass in wood sash and frames.

Counter Screens. Black marble counters, with wrought iron screens.

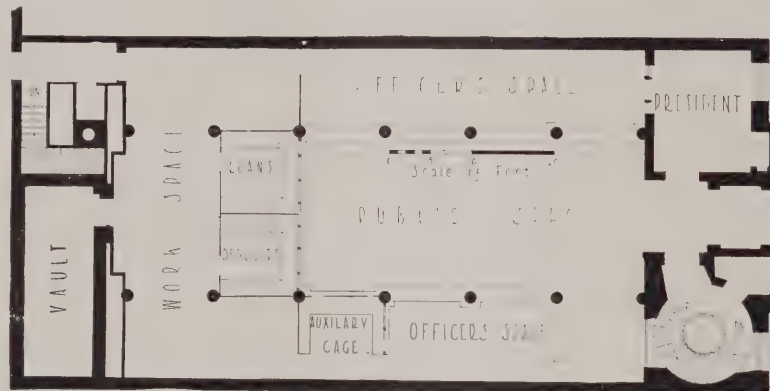
Heating and Ventilating. Steam heat and air-washed cooling type ventilation.

Type of Lighting. Direct.

Date of Contract. September, 1925.

Total Cost of Building. \$73,000.

Cubic Foot Cost. 51.5 cents.



PLAN, CALIFORNIA SECURITY LOAN CORPORATION, PASADENA

WALLACE NEFF, ARCHITECT





ENTRANCE FACADE



Plan on Back

Photos. Caufield & Shook

BANKING ROOM
FEDERAL LAND BANK, LOUISVILLE
D. X. MURPHY & BRO., ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction. Fireproof, with steel frame and reinforced concrete slabs.

Exterior Materials. Limestone and brick.

Interior Materials. Marble and plaster; linoleum and cork flooring.

Windows. Steel and hollow metal.

Vault and Safe Deposit Provision. Fireproof vaults with steel reinforcement.

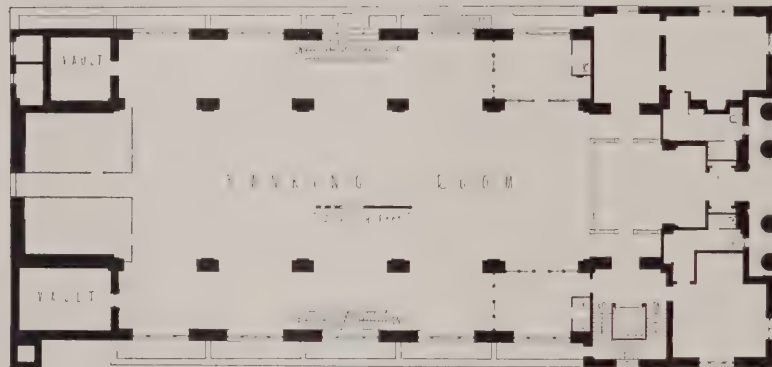
Type of Lighting. Direct.

Heating and Ventilating. Split system.

Year of Contract. 1925.

Total Building Cost. \$376,389.

Cubic Foot Cost. 49.75 cents.



PLAN, FEDERAL LAND BANK, LOUISVILLE

D. X. MURPHY & BRO., ARCHITECTS





GENERAL VIEW



ENTRANCE DETAIL



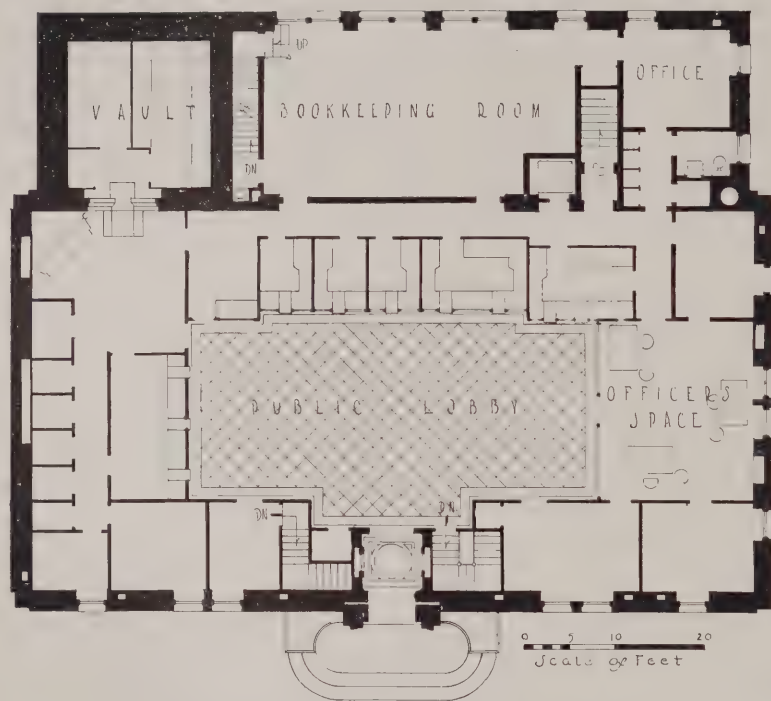
BANKING ROOM

Plan on Back

DANBURY NATIONAL BANK, DANBURY, CONN.
 PHILIP SUNDERLAND & EDMUND WATSON, ARCHITECTS; JOHN MEAD HOWELLS, CONSULTING ARCHITECT

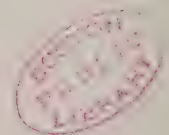
CONSTRUCTION DATA

Type of Construction. Fireproof.
Exterior Materials. Indiana limestone.
Interior Materials. Marble and bronze.
Windows. Metal sash of special design.
Counter Screens. Solid marble and bronze.



DANBURY NATIONAL BANK, DANBURY, CONN.

PHILIP SUNDERLAND & EDMUND WATSON, ARCHITECTS; JOHN MEAD HOWELLS, CONSULTING ARCHITECT





GENERAL VIEW



BANKING ROOM



ENTRANCE DETAIL

Plans on Back

AMERICAN STATE BANK, SAGINAW, MICH.
ROBERT B. FRANTZ & JAMES A. SPENCE, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction. Steel frame designed to carry ten additional stories. Concrete floor slabs.

Exterior Materials. Sandstone; polished granite base.

Interior Materials. Marble floors and wainscot; rubber tile in safe deposit section, and oak floors in offices. Plaster walls and ceilings.

Windows. Steel; lower vents casement; upper vents crank-operated.

Counter Screens. Marble counter with wrought iron, bronze and glass screens.

Vault and Safety Deposit Provision. Combined trunk and silver storage on basement floor.

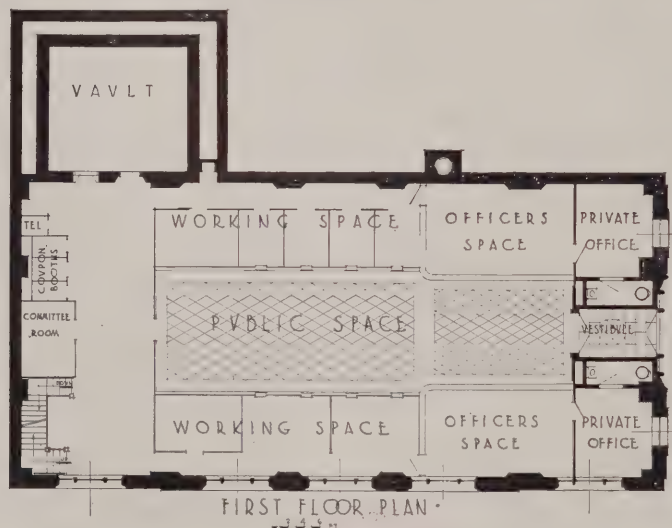
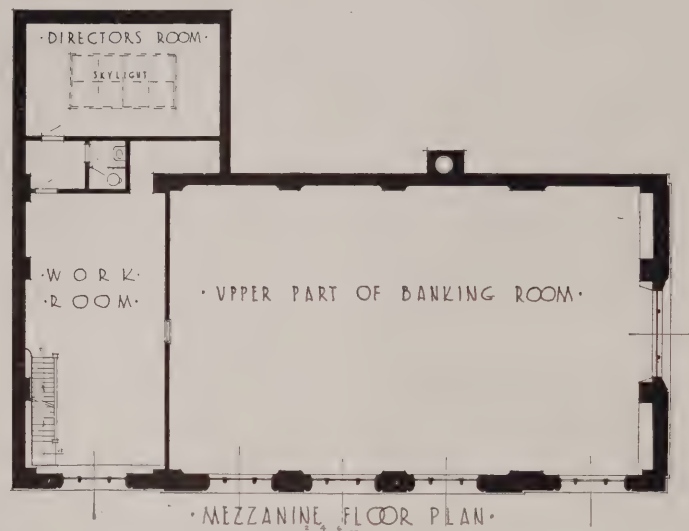
Lighting. Direct and indirect.

Heating and Ventilating. Vacuum system, direct and indirect, with thermostatic control.

Date of Contract. September 16, 1926.

Total Building Cost. \$200,000.

Cubic Foot Cost. \$1.05.



PLANS, AMERICAN STATE BANK, SAGINAW, MICH.
ROBERT B. FRANTZ & JAMES A. SPENCE, ARCHITECTS



GENERAL VIEW



Photos. Amemya

ENTRANCE LOBBY



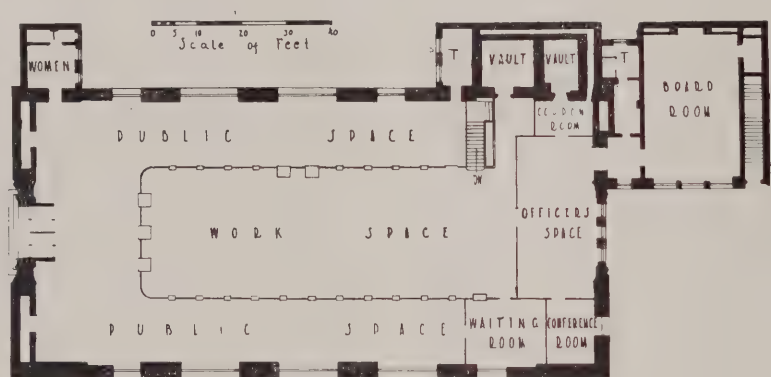
BANKING ROOM

Plan on Back

SOUTH BROOKLYN SAVINGS BANK, BROOKLYN
McKENZIE, VOORHEES & GMELIN, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Fireproof throughout.
Exterior Materials: Granite base; limestone facade.
Interior Materials: Marble floors and wainscot; imitation stone walls.
Windows. Iron.
Counter Screens: Marble and bronze.
Type of Lighting: Direct.
Heating: Steam.
Date of Contract: November 17, 1922.
Total Cost: \$650,000, including furniture and fixtures.



PLAN, SOUTH BROOKLYN SAVINGS BANK

McKENZIE, VOORHEES & GMELIN, ARCHITECTS



GENERAL VIEW



Photos. Peasley-Jordan

ENTRANCE VESTIBULE



Plan on Back

OFFICERS' SPACE AND BANK SCREEN

BRANCH OF BANK OF CALIFORNIA, PORTLAND, ORE.
A. E. DOYLE & ASSOCIATE, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction. Steel and concrete.

Exterior Materials. Marble, terra cotta, and tile roof.

Interior Materials. Marble, plaster and bronze.

Windows. Metal frames.

Counter Screens. Marble and bronze.

Vault and Safe Deposit Provision. 18-inch reinforced concrete.

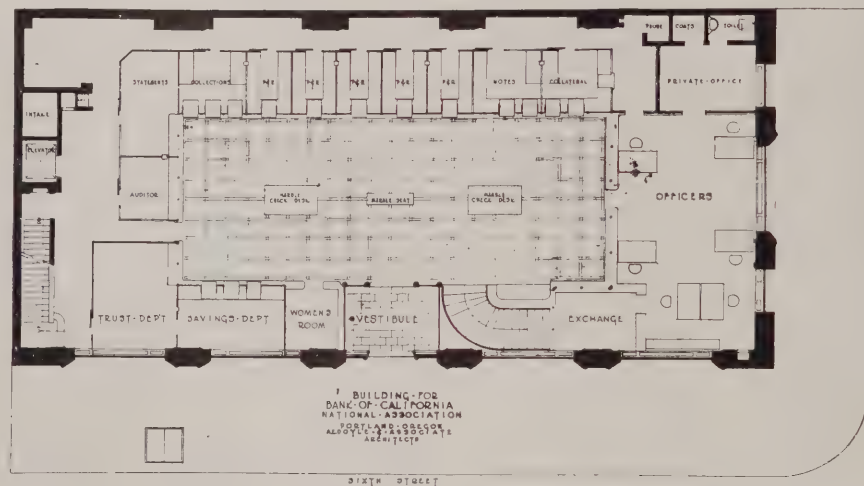
Type of Lighting. Banking room, X-ray indirect; remainder of building, direct.

Heating and Ventilating. Direct radiation and fan system.

Year of Contract. 1924.

Total Building Cost. Approximately \$414,000.

Cubic Foot Cost \$1.03, based on complete cost, including furniture, fixtures and architects' fees.



PLAN, BRANCH OF BANK OF CALIFORNIA, PORTLAND, ORE.

A. E. DOYLE & ASSOCIATE, ARCHITECTS



GENERAL VIEW



Photos, Paul J. Weber

ENTRANCE DETAIL



MEMBERS' COURT

Plans on Back

FEDERAL RESERVE BANK, BOSTON
R. CLIPSTON STURGIS, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction. Fire resistant (first class).

Exterior Material. Limestone.

Windows. Bronze.

Counter Screens. Cast iron and glass.

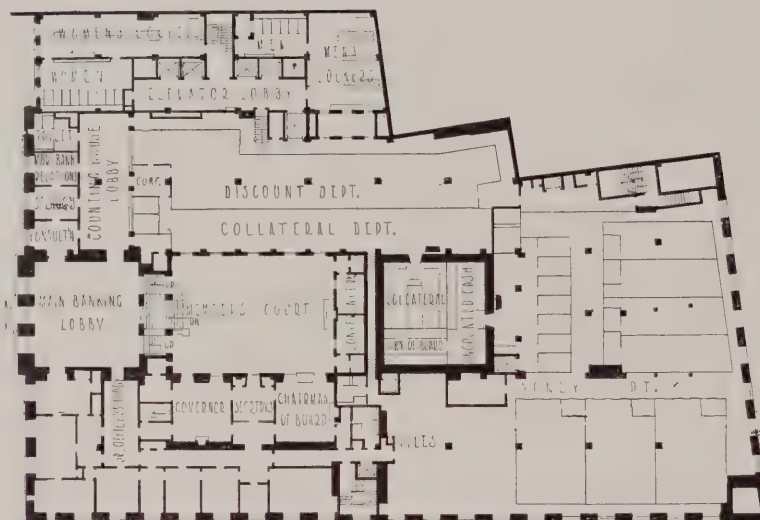
Vault and Safe Deposit Provision. Special.

Type of Lighting. Direct.

Heating and Ventilating. Direct heat. Forced circulation of outside air in whole or in part.

Date of Contract. January 1, 1920.

Cubic Foot Cost. \$1.05.



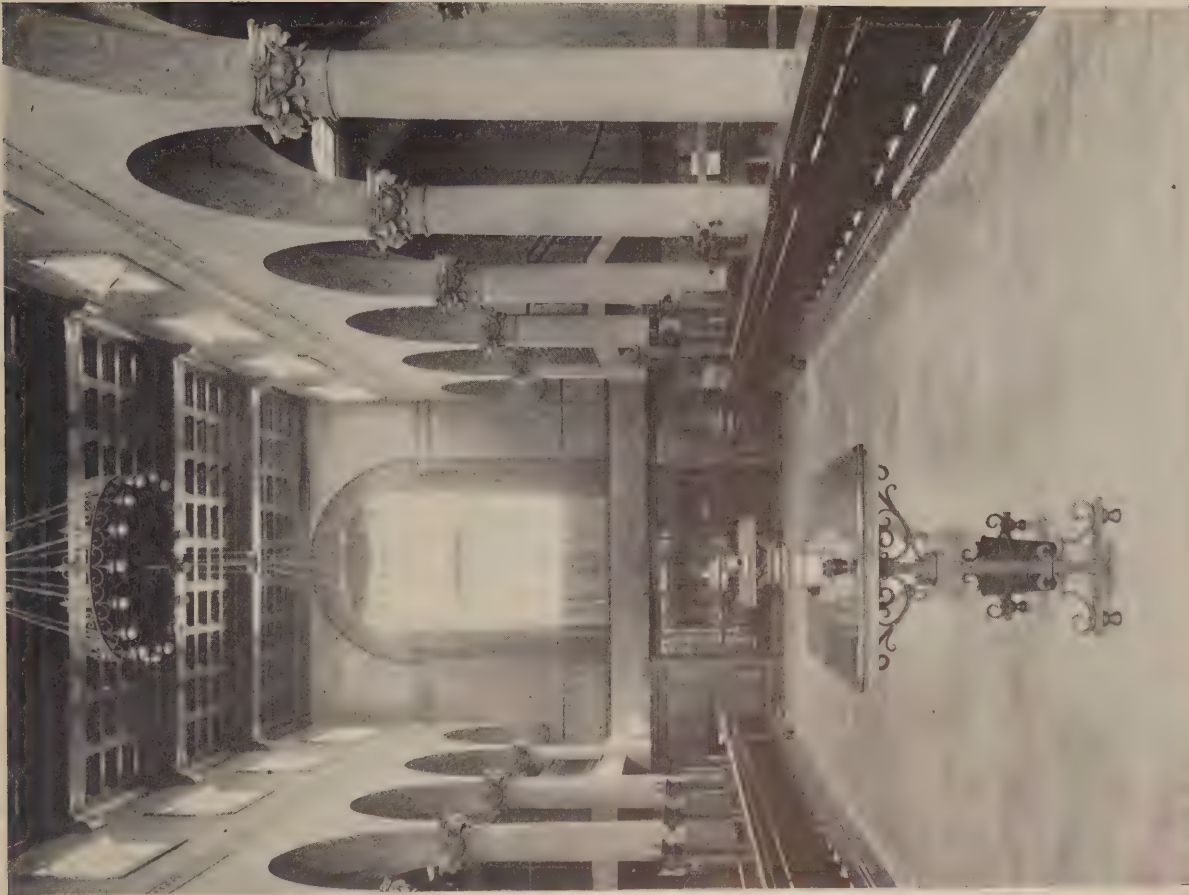
FIRST FLOOR



GROUND FLOOR

PLANS, FEDERAL RESERVE BANK, BOSTON

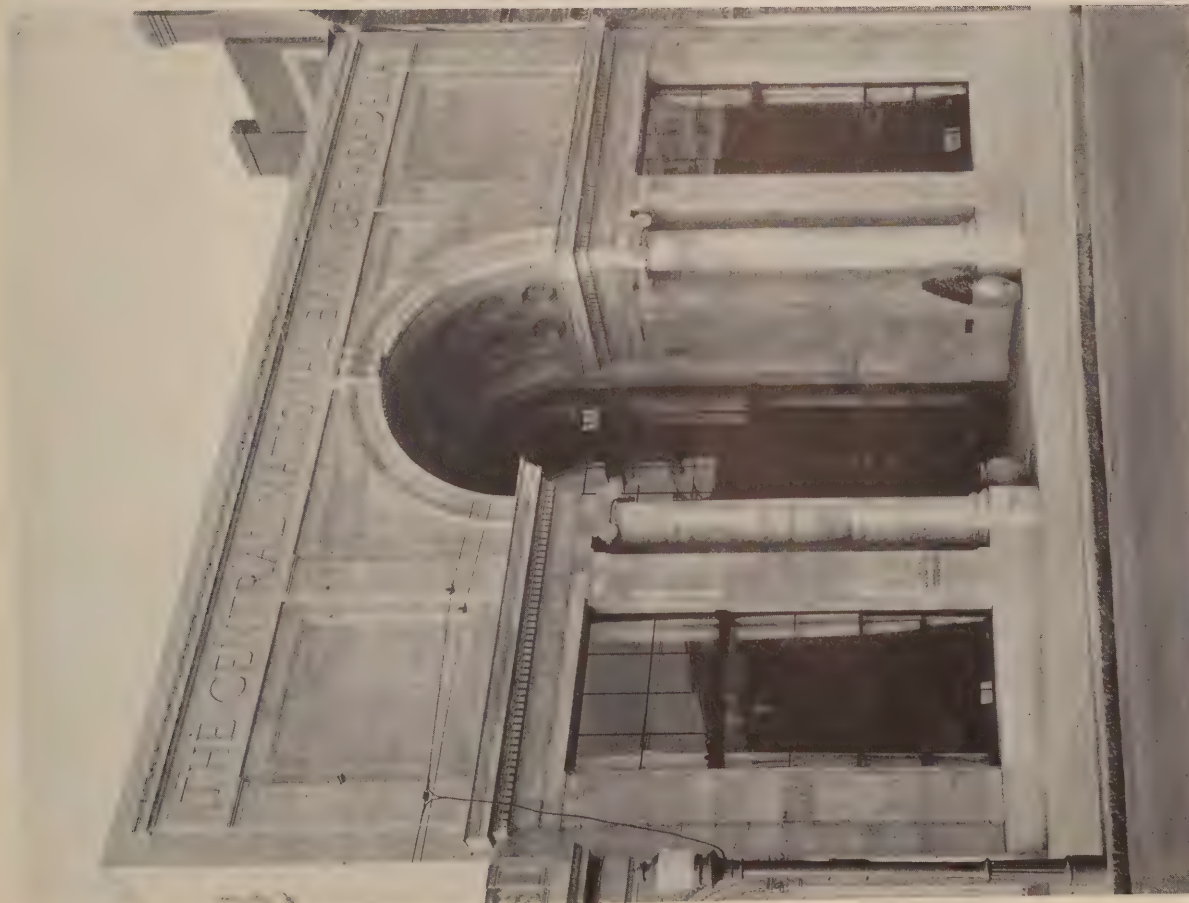
R. CLIPSTON STURGIS, ARCHITECT



Plan on Back

PUBLIC SPACE

THE CENTRAL NATIONAL BANK OF PASADENA
CYRIL BENNETT & FITCH H. HASKELL, ARCHITECTS



FRONT ELEVATION

Photos. A. E. Arnold

COST AND CONSTRUCTION DATA

Type of Construction. Garage in basement under whole area. Fireproof to first floor. Semi-fireproof above. Steel columns; brick; metal lath.

Exterior Materials. Cast stone; wrought and cast iron

Interior Materials. Marble floor and base. Plaster walls and ceilings.

Windows. Steel sash.

Counter Screens. Marble, wood, iron and glass.

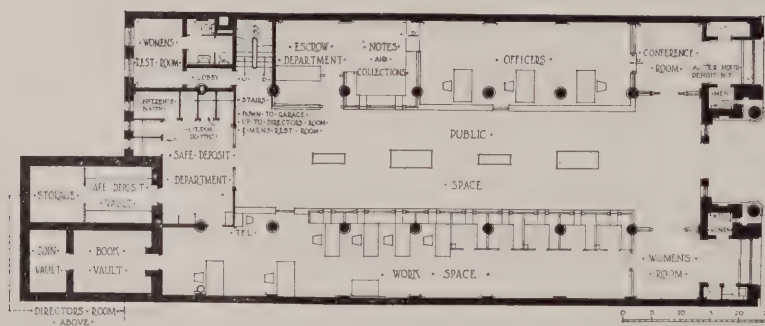
Type of lighting. Direct.

Heating. Hot air.

Year of Contract. 1924.

Total Cost. (Building and fixtures, not including vault doors), \$90,000.

Cubic Foot Cost, including garage. 35.5 cents.



PLAN, THE CENTRAL NATIONAL BANK OF PASADENA

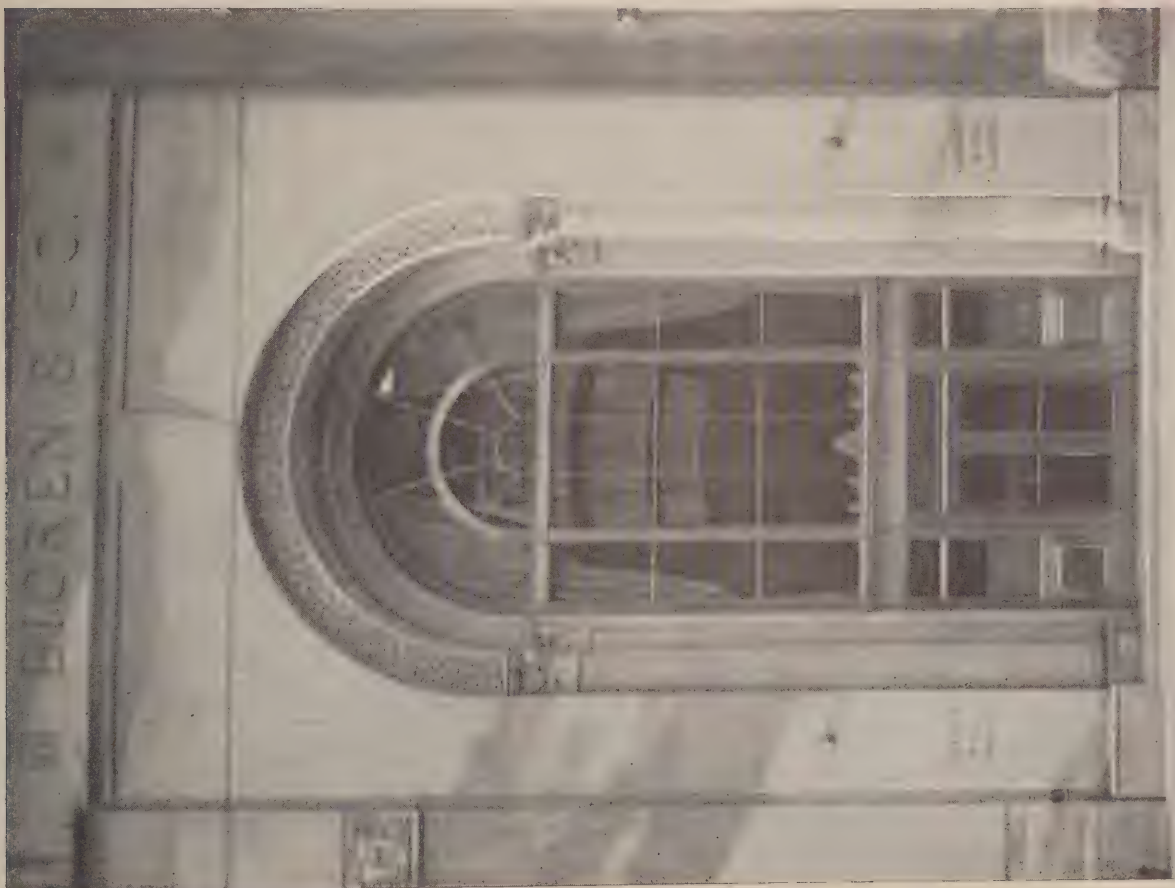
CYRIL BENNETT & FITCH H. HASKELL, ARCHITECTS



Plan on Back

BANKING ROOM

BIOREN & CO., BANK, PHILADELPHIA
ARTHUR H. BROCKIE, ARCHITECT

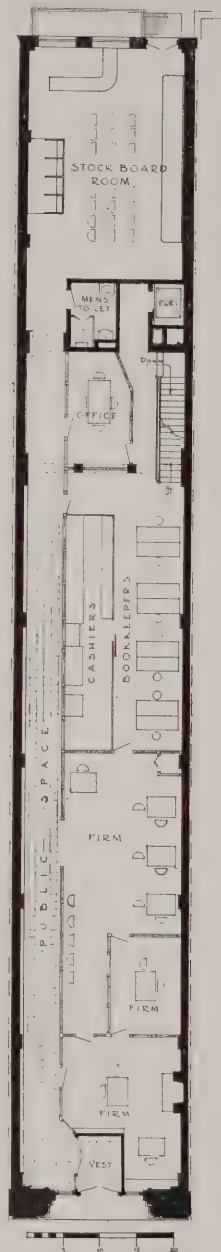


FRONT ENTRANCE

Photos. William H. Rittase

COST AND CONSTRUCTION DATA

Type of Construction. Fireproof. Steel and concrete.	Counter Screens. American walnut.
Exterior Materials. Sandstone and bronze.	Vault Provision. Concrete.
Interior Materials. Marble floors and wainscot; rubber floors in working spaces. Plaster walls and ceiling.	Type of Lighting. Concealed X-ray reflectors.
Windows. Projecting type steel sash.	Heating and Ventilating. Vapor heat; oil burner. Forced exhaust ventilating.
	Date of Contract. June 28, 1927.
	Cubic Foot Cost. 69 cents.



PLAN, BIOREN & CO. BANK, PHILADELPHIA

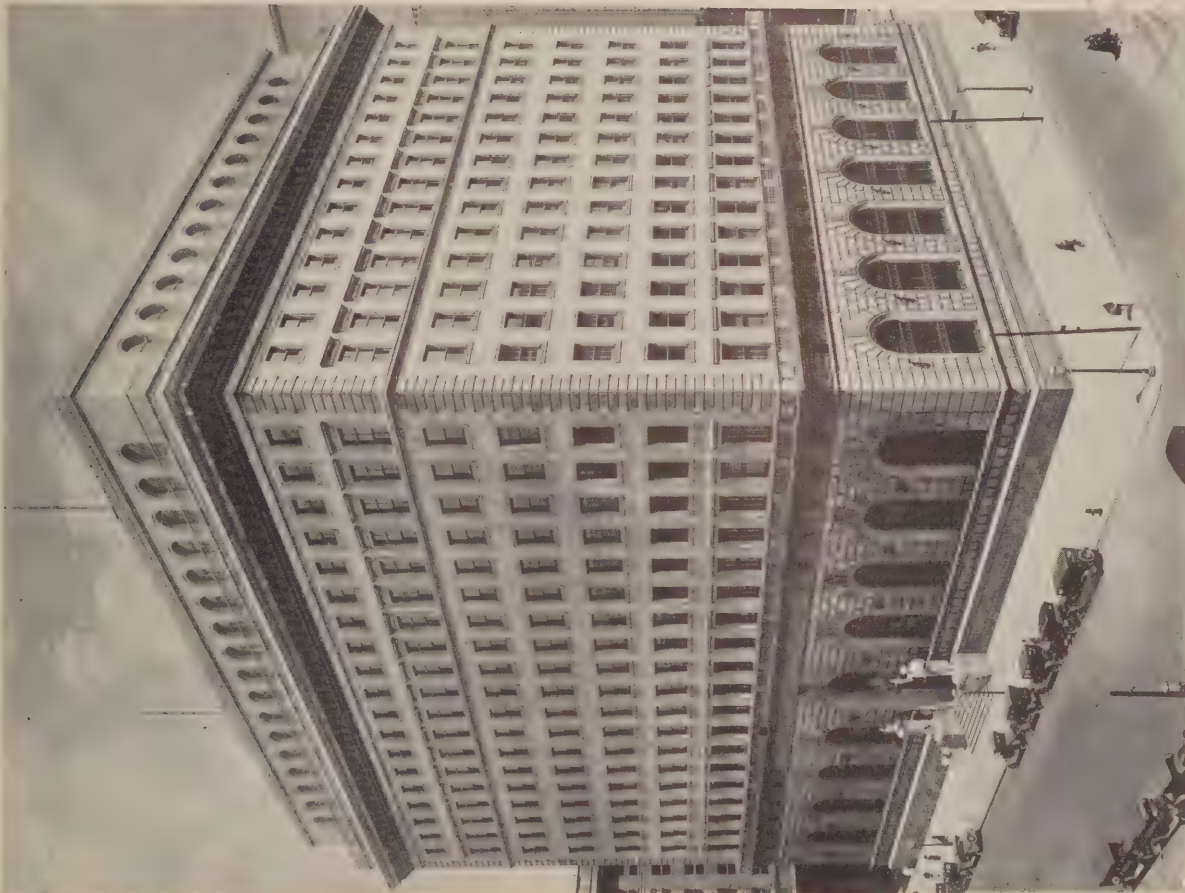
ARTHUR H. BROCKIE, ARCHITECT



Plans on Back

ENTRANCE LOBBY

FEDERAL RESERVE BANK, CLEVELAND
WALKER & WEEKS, ARCHITECTS



GENERAL VIEW

Photos. E. L. Fowler

COST AND CONSTRUCTION DATA

Type of Construction. Steel and concrete.

Exterior Materials. Granite base and marble walls.

Interior Materials. Tennessee marble floors.
Marble walls and piers.

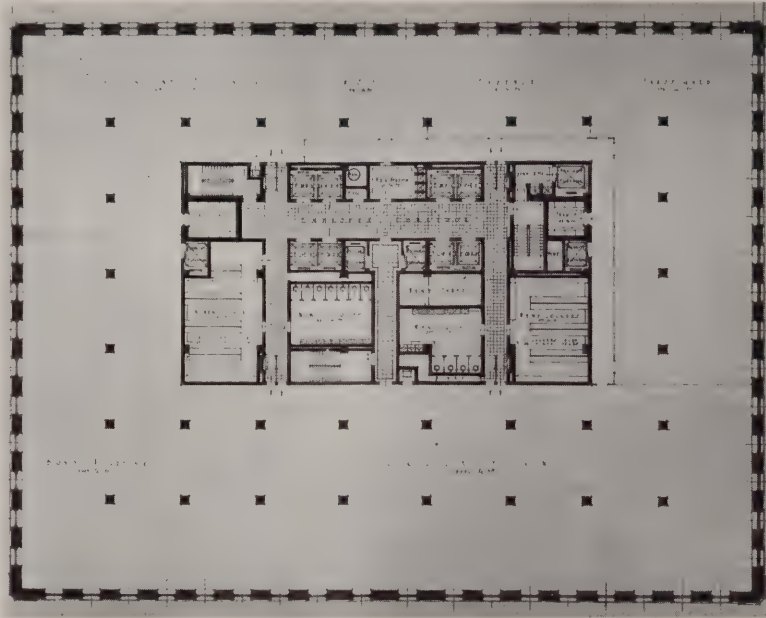
Windows. Covered with Swedish iron grilles.

Counter Screens. Marble counters with Swedish
iron screens.

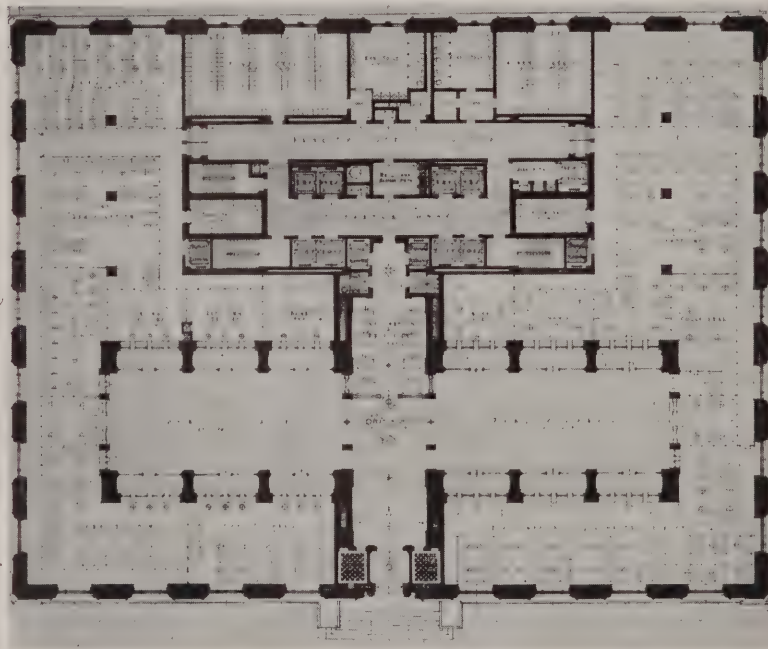
Vault and Safe Deposit Provision. Two-story
vault of specially reinforced concrete.

Lighting. Furnished by independent power plant
within the building.

Heating and Ventilating. Steam heat. A washed
air, forced ventilation system changes the air
from 6 to 15 times per hour.



THIRD FLOOR



FIRST FLOOR

PLANS, FEDERAL RESERVE BANK, CLEVELAND

WALKER & WEEKS, ARCHITECTS

THE ARCHITECTURE OF BANKS

BY

FREDERIC C. HIRONS

OF THE FIRM OF DENNISON & HIRONS, ARCHITECTS

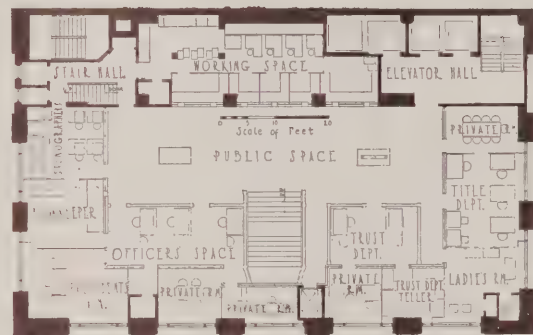
THE designing of a banking institution in no way differs in principle from the designing of any other building. One must first of all get complete information from the operating officers concerning their needs and requirements, possible future growth, and the very vital point as to how much they wish to spend. To start the studies for a bank plan or layout, the architect should have this information, which should be supplied by the bank:

1. A survey with angles, dimensions and grades.
2. Number of the bank's employees.
3. Number of officers in public officers' space.
4. Number of private offices adjacent to officers' space.
5. Number of tellers' wickets desired for paying and receiving, and data as to whether tellers are both paying and receiving, or work separately.
6. Loans, discounts, notes, new business departments, etc., and number of tellers in each.
7. Number of bookkeepers.
8. Safe deposit department accommodations:
 - (a) Number of boxes and sizes.
 - (b) Number of coupon booths.
 - (c) Number of committee rooms and sizes.

With this information at hand, the architect can study the plan, always keeping in mind the fact that the building is first of all to house a banking business, and that the practical needs and the architectural effect must be considered simultaneously. It will be a case of give and take in any problem, because the architect will naturally wish the building to be as architecturally attractive as possible, but he should realize that if a banker raises any objections to the design and gives excellent reasons from an administrative point of view for these objections, the artistic must give way to the practical. Keeping this important viewpoint in mind, he must endeavor to obtain the best architectural solution possible, because, for a building to be really fine, it should first of all answer every requirement for which it is built, which is obviously true of every utilitarian type of structure. A great deal of worry on the part of the bank officials and the architect could be avoided if, when they decide they are going to build, they would select their architect before they buy the property on which they wish to build, thus taking advantage of the architect's knowledge and training as to which piece of property would give them the best building. He could then study their problem



Photo. William E. Fitzpatrick



Second Floor Plan



First Floor Plan

Liberty Title and Trust Co., Philadelphia
Dennison & Hirons, Architects



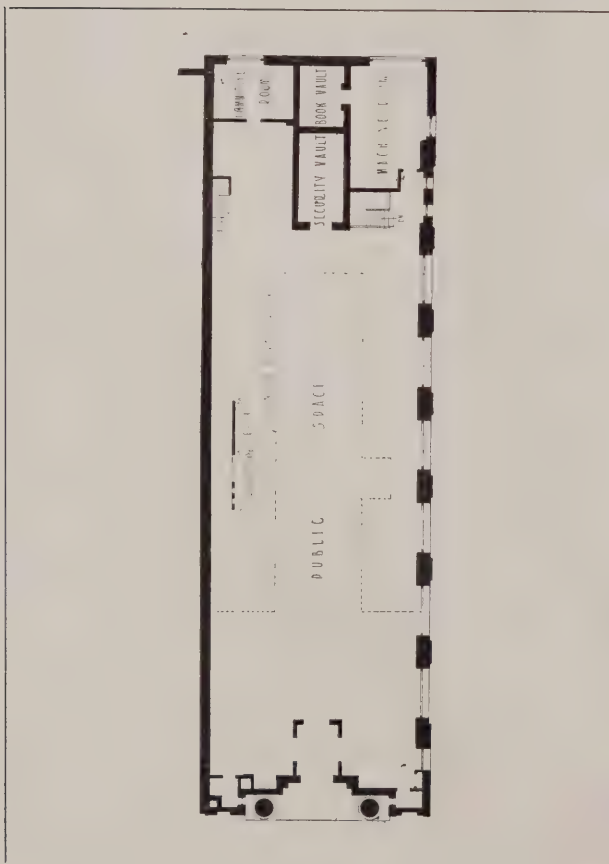
Front Elevation



Banking Room

Bethlehem National Bank, Bethlehem, Pa.

Dennison & Hirons, Architects



Main Floor

and be thoroughly familiar with their needs and possible future expansion, and could advise his clients as to which piece of land was more desirable for their purpose; but, unfortunately, this is seldom the case. The writer has in mind a banking institution that bought a piece of property and then selected an architect to design the building. When he had progressed to a certain point with his studies, he realized that the lot was only large enough for the bankers' immediate needs, so he advised them to buy, or at least to get options on some of the adjacent property. Unfortunately, this was not possible, and as a result this bank will within the next year or so have to get another lot and put up another and larger building. This short-sighted and expensive course could easily have been avoided.

No two problems are alike. There are numerous types of plans which will be suggested to the architect, but the four principal types one has to consider in planning any banking structure are:

1. Individual building on an interior lot.
2. Individual building on a corner lot.
3. Office building over bank, on an interior lot.
4. Office building over bank, on a corner lot.

In many instances any one of these conditions may be complicated by having to adapt the building to an irregular-shaped lot. In some cases, especially in large cities where land is very valuable, it is more economical to put stores on the ground floor, and the bank on the second floor above the street, which



Public Space



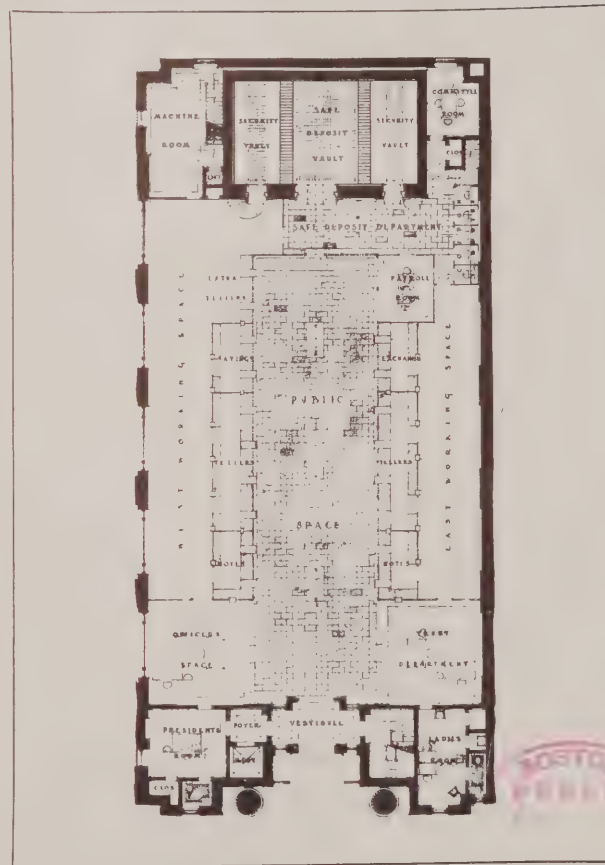
Front Elevation

The First National Bank, Blairsville, Pa.

Dennison & Hiron, Architects

makes it necessary to provide a spacious and monumental entrance and stairway to lead to the banking room. This plan insures an appreciable source of revenue from the ground floor stores. In New York there are many examples of this arrangement. Good examples are the Bankers Trust Company, 42nd Street and Fifth Avenue, Montague Flagg, architect; the State Bank, 43rd Street and Eighth Avenue, Dennison & Hiron, architects; and the American Exchange Bank, Pershing Square Building, 42nd and Park Avenue, York & Sawyer, architects.

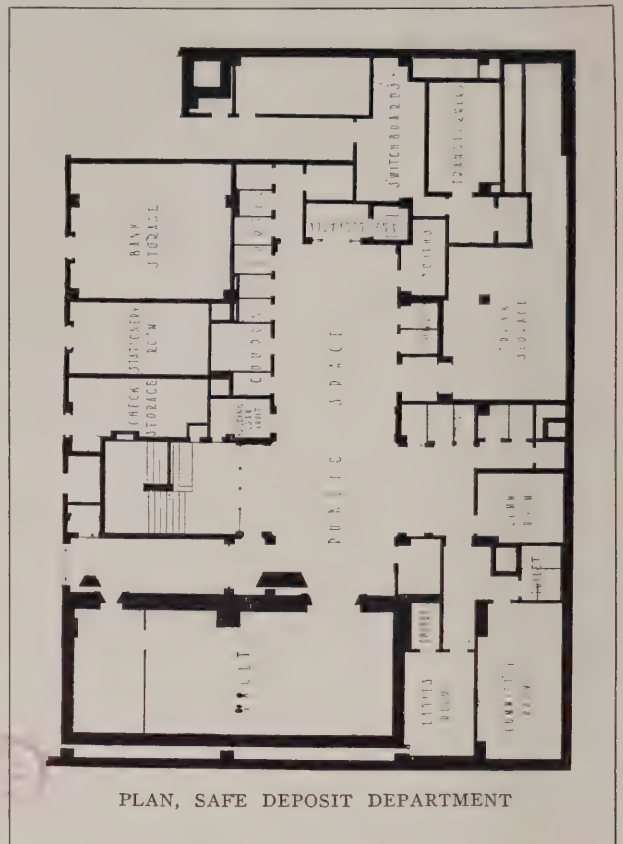
The designing of the Federal Trust Company in Newark involved the problem of placing a bank in an office building on an interior lot. This bank is on the ground floor with the main entrance to the bank opening from the entrance of the office building. Here the space for the officers' desks is located along the front wall. There is one decided advantage in this layout, inasmuch as it gives every officer, from his desk, an unobstructed view of the public space and every teller's wicket, so that if any special department is greatly rushed with business, it can readily be remedied by putting another teller in the department. In the study of this plan, the question of future expansion was of paramount importance, and the bank, having control of the building in the rear of the property, which extended through to another street, wished to secure a plan which would enable it to double its capacity at some future date. In Plan B on page 840, the present portion of the



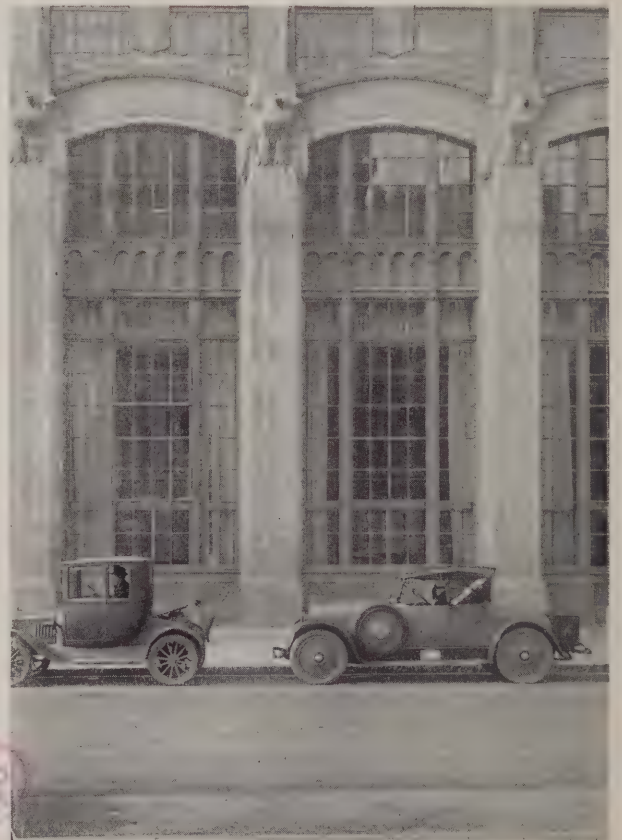
Main Floor Plan



GENERAL VIEW



ENTRANCE DETAILS



DETAIL OF WINDOWS

Photos. John Wallace Gillies, Inc.

THE FEDERAL TRUST CO., NEWARK
DENNISON & HIRONS, ARCHITECTS



CORNER OF BANKING ROOM



ENTRANCE TO SAFE DEPOSIT DEPARTMENT



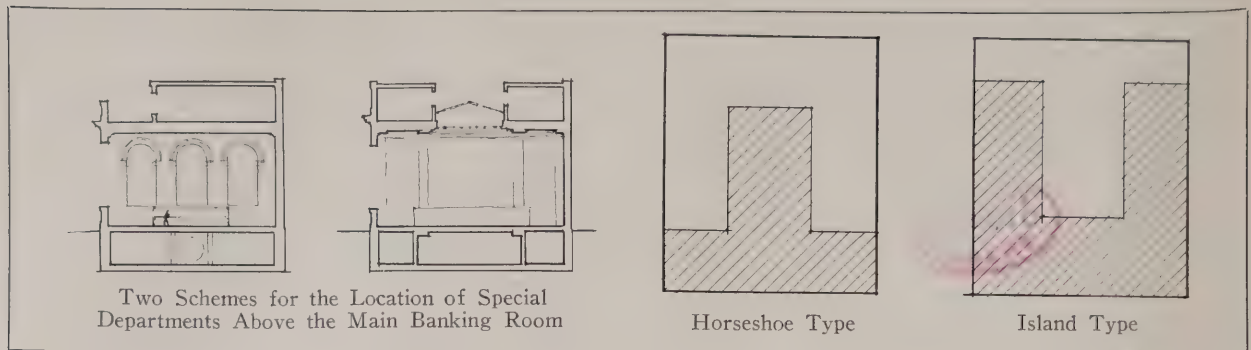
WROUGHT IRON GATE IN SAFE DEPOSIT DEPARTMENT



WROUGHT IRON GRILLE IN ENTRANCE LOBBY

THE FEDERAL TRUST CO., NEWARK

DENNISON & HIRONS, ARCHITECTS



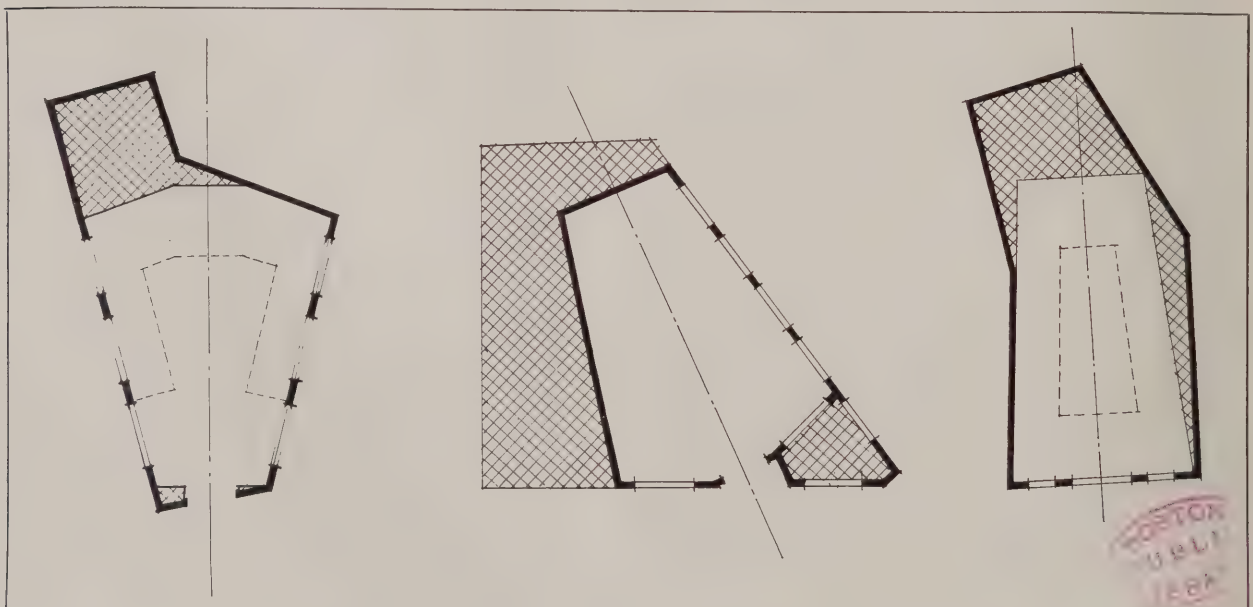
building is shown in solid black, and the hatched portion of the future development. Plans A, B, and C on page 840 show the various schemes that were presented to and considered by the officers of the bank. In this instance the number of officers in the officers' space and the 26 or 30 tellers' wickets that were required, made it necessary to place the safe deposit department in the basement. This is generally true of all large metropolitan bank buildings, because the ground floor is decidedly too valuable to use for safe deposit business. Numerous schemes were tried for the layout of this department, but it was finally decided to place the stairs leading to it at the center of the public space, so that every officer from his desk can see who is going down. The plan of the safe deposit department is shown on page 836, and is a practical and simple layout for the banking business of this department. The plan makes possible excellent supervision, which is always highly desirable.

The Liberty Title and Trust Building, in Philadelphia, shown on page 833, is an example of an office building with the bank raised one floor above the level of the street, the ground floor being used for stores, which naturally yields considerable reve-

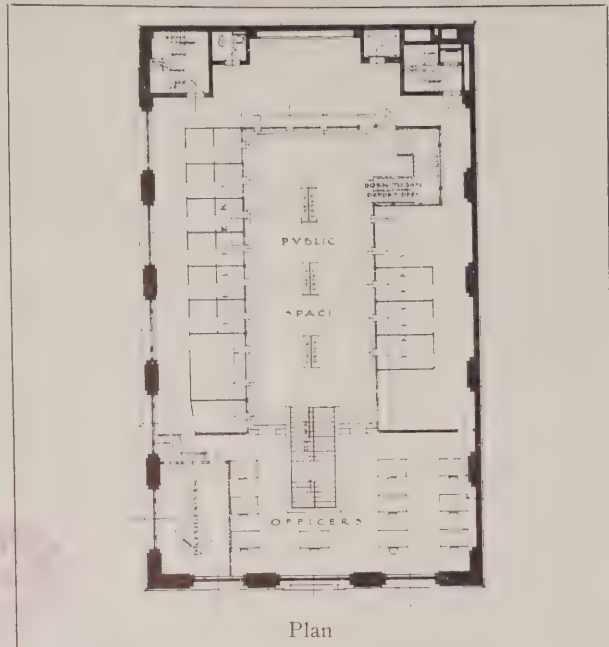
nue and shows a better return on the money invested.

It is true that the architect must first thoroughly familiarize himself with the various requirements and needs of his clients, and then study the various possible schemes so that he will finally achieve a plan which is not only practical in the use of space and economical from an administrative point, but which will almost invariably give the best looking building from an architectural point of view. It is unfortunate that there are many concerns which go under the name of equipment engineers and architects, or bank engineers and architects. Such organizations usually have an experienced corps of salesmen whose business it is to secure contracts; when these are closed, the projects are turned into the office, where some draftsman is placed in charge of the plan and architectural design. It is regrettable that in 75 per cent of the smaller banks throughout the country, architects are chosen more on their ability as salesmen than on their ability as artists or master builders. The result being reflected in their work, which generally leaves much to be desired.

There are numerous details that must be borne in mind in designing the plan of the interior of a bank, and one of the most important is the shape of the



Three Schemes of Plan for Banks on Irregular Shaped Lots



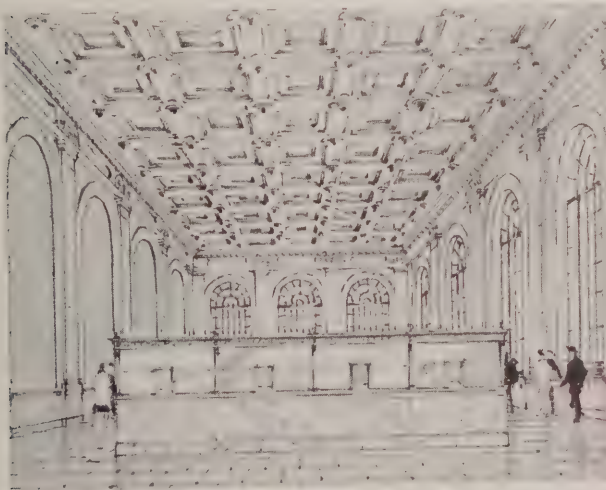
The State Bank & Trust Co., New York

Dennison & Hiron, Architects

public space,—whether it is to be of the “island” or the “horseshoe” type. National banks and trust companies are most partial to the horseshoe type, but savings banks will usually prefer the island type, because the working force is then more closely related, which is a vital point in the business of a savings bank. In the horseshoe plan, the various departments are much more flexible, and this plan more readily lends itself to expansion when the need arrives. As for the architectural effect, the horseshoe will give much finer results, as illustrated by two sketches shown on this page. The horseshoe plan gives a clear, unobstructed view of the room, whereas the island plan not only blocks a good view but, furthermore, has the disadvantage of splitting the public space in two parts. Another principle that the architect should be careful to consider, especially in medium-sized banks, is the question of acoustics.

Circular, vaulted or domical ceilings are quite likely to act as sounding boards; this fact applies particularly to banking rooms of 30 feet or under in height. The architect, in designing and planning his building, must realize that he can go just so far in the general scheme and design, because the technical expert will have to consult with him many times after his sketches are finished, and there are always many structural details that affect the plan of a building and the method of its construction.

Sometimes an architect will find a banker who has very definite ideas as to what he wants, and the arrangements of his needs. This may make it difficult to obtain an architecturally successful bank. The best thing to do in a case of this kind is to make sketches of the scheme the client wishes, and to then make sketches of other schemes giving more possibilities from an architectural point of view, but at



Island Type



Horseshoe Type

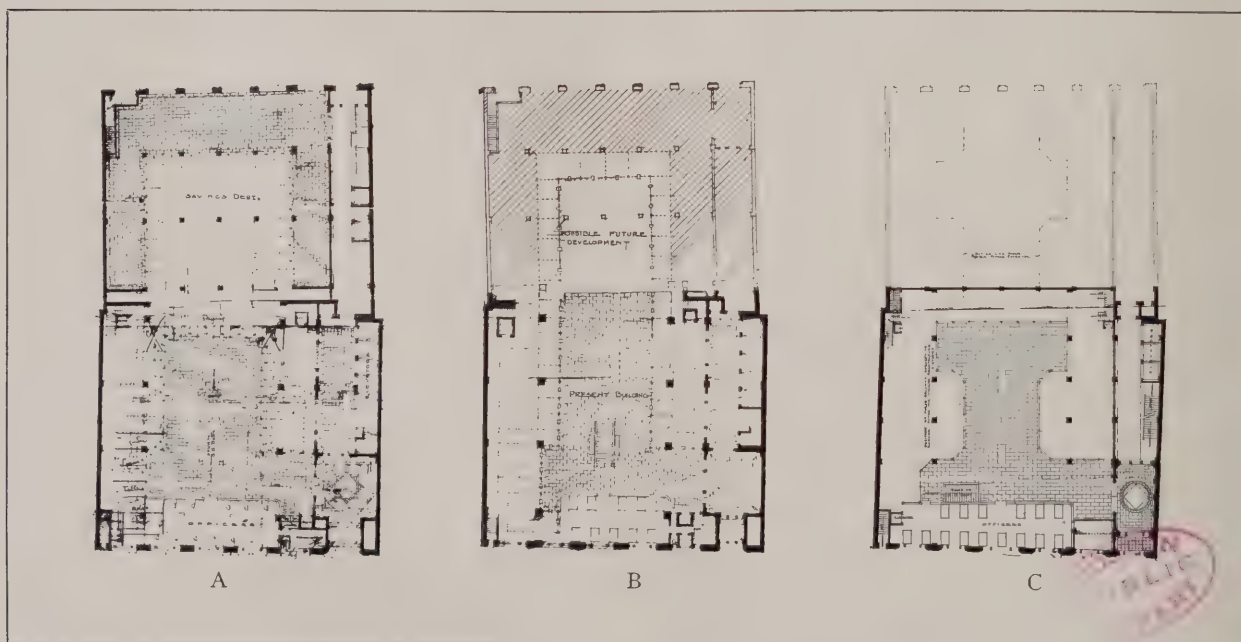
Sketches Showing Two Types of Bank Layout

the same time embodying the requirements of the bank. The client will almost invariably realize the difference and be perfectly willing to be guided by the architect's ability to visualize his room and layout. In many cases where architects are called upon to design individual bank buildings, after the main banking room has been laid out with everything the banker demands on the ground floor, and with the safe deposit department, vaults, books and box storage, mechanical equipment, etc., taken care of in the basement, there still remain the bookkeeping, transit and mailing departments, clerks' locker rooms, toilets, etc., to be located somewhere. But the bank officials insist that the building shall have the appearance on the outside of a fine, large banking room. The writer recalls two instances of this, and the problem was solved as shown by two sketches which are shown at the top of page 838.

In the successful arrangement of all these necessary details and departments, great ingenuity is required on the architect's part. So the purpose of this article is to endeavor to show how the general plan and layout of the building may be determined by making sketches to a point where they shall receive the approval of the building committee, that the architects can make a close approximation as to what the costs, time of completion and materials are going to be. When the general plans and design of the building are approved, the next step is to prepare the working drawings, and if the building is the first bank structure the architect has designed, he will save himself much worry and many mistakes if he will confer with some of the engineers who make a specialty of banking equipment, vaults, electrical protection, etc. The day has gone by when the banker wants his building to look like a fortress, and as if it were impossible to get into, or to get

out if one were in it. The modern building must be inviting and cheerful, and the evidences of strength and security must be shown where the securities are kept and in the safe deposit department. The officers' space should be out in the open part of the banking room, preferably adjacent to the main entrance, and in close proximity to at least the note and discount tellers. In country and smaller banks, the bookkeeping department is generally put in the rear of the tellers' cages; but where every square foot of area is valuable, as in the larger institutions, this can be placed on a floor or mezzanine above the main banking room. This causes no inconvenience whatever if there is an adequate installation of telautographs, intercommunicating telephones or pneumatic tubes, so there may be instant communication between the various departments. Mr. Sawyer, of the firm of York & Sawyer, in a most able article on the planning of banks in *THE ARCHITECTURAL FORUM* in June, 1923, illustrated a number of the largest banks in the country.

In addition to the conditions here briefly enumerated, there are numerous others which are bound to present themselves, especially in some of the smaller bank plans. The American banker demands the most efficient, up-to-date layout and equipment possible, and he certainly has every right to expect it. The American banking methods and system of doing business are without doubt the most efficient in the world. The primary purpose of a bank building is to properly house and take care of the existing work and requirements and provide for development in the future. Today, with the constant and various consolidations of banking institutions, it is more imperative than ever before to be sure that adequate provision is made to take care of this vital matter of future growth, certain to come to any vigorous bank.



Various Schemes Submitted for the Bank
Layout of The Federal Trust Co. Building, Newark
Dennison & Hirons, Architects

THE FUNDAMENTALS OF BANK PLANNING

BY

ALFRED HOPKINS

OF THE FIRM OF HOPKINS & DENTZ, ARCHITECTS

BANKERS do not erect buildings without the advice of those whose business it is to prepare plans and specifications for them, but they do buy lots on which to build without the slightest knowledge of even the rudiments of bank planning. When the lot is purchased, certainly the limits of such important items as floor areas, light and ventilation, and the vital possibilities of expansion have been fixed. The architect cannot go beyond the confines established by that important individual, the city surveyor, who puts down his little arrows and makes his little markings and says: "Thus far shalt thou go, but no farther;" and here shall that great idea be stayed. In order to give some idea of the value and importance of lot areas, and some idea as to what sizes lend themselves best to bank buildings, it will be necessary to set forth a few elemental principles of bank planning. Indeed, all the details of the bank's requirements could well be determined by the lot's bounds and limits,—every one of them.

Now as to actual areas, I shall commence with minimums,—and how I hate them! They have no place in broad, consequential building. I believe more errors of judgment, business judgment and building judgment, result from the conservatism which hesitates to depart too far from the minimum than from any other one human frailty. If a man starts out to build a million-dollar building, he will be wise if he builds it in a million-dollar way. If he builds a hundred-thousand-dollar building, let him do it in a hundred-thousand-dollar way, but he should not proceed upon either adventure except upon the broad basis of the legitimate need of the structure involved. I remember a story told me by an old friend who was very fond of playing poker. But he always played for small limits. One day he got into a game with a high limit, found he was playing timidly and losing regularly. He said to himself: "I am not playing my game. I am thinking each time of the amount of every ante and what it costs me to draw cards. I'll forget all this and play the game as I am accustomed to play it." He did, and he won. And that is just the attitude to have toward building.

But to get back to our minimum again, no lot should be narrower than 40 feet for the type of bank shown in Fig. 8. This width allows a central public space of 18 feet, a width of 9 feet, 6 inches from the face of the counter to the back of the wall, and 3 feet for the thickness of the outside walls. But every additional foot in excess of this miserable minimum will be acclaimed by the bank's architect and its personnel. The wide lot has many advantages. Having for the moment established its minimum width, I shall refer to an important phase of bank design. This is the value and location of mez-

zanine floors. Their value in providing additional area is great, but they belong at the rear of the building and not at the front,—where the commercial architects have always put them. At the rear they are not only useful but they are indispensable, for work rooms, cloak rooms, file rooms, directors' rooms and the like. And the rear placement of the mezzanine leaves the front unobstructed, a vital requirement for modern banking. Consequently, every lot should have depth enough for well lighted mezzanine floors at the back. And interior lots, because they are more difficult to light, should be deeper than corner plots. The bank illustrated in Fig. 9, for instance, a normal example, required a depth of not less than 100 feet. This allows 12 feet for the width of the light court between the main banking room and the mezzanines at the back. A corner lot would permit mezzanines to be lighted on the side, so the space occupied by the light court required at the back of an interior lot is not so necessary. On this theory an interior lot, to provide the same relative floor area for mezzanines, should be at least 12 feet longer than a corner lot. One may think this an inconsequential point. It is not. It represents a difference of perhaps 12 to 15 per cent in the average lot length. Percentages are understood and appreciated by bankers. A 12 per cent yield, more or less, on a security is not inconsequential. An inch is not much, but put it on the end of a man's nose, and he will tell you it is a whole lot. It is the consideration of these seemingly inconsequential things which many times spells the difference between a partial and a pronounced success. From the foregoing, the minimum or miserly dimensions for interior lots would be 40 feet for width and 85 feet in depth.

But there is every advantage in having an increased width. Every foot added means another foot in the public space. Banks meet their certain growth by increasing the extent of their contact with the public. To do this, adequate area for the public is the first need. That is why width is important. The increased width at the front is advantageous; increased width at the back is sometimes equally so. Any possible broadening out of the lot area at the rear is extremely valuable. Assuming that there are three mezzanines, not an unusual number, rear lot areas may be doubled three times. The bank at Monessen, shown in Figs. 3 and 3A, has an extension at the rear which makes clear the value of additional width at that point. It must be possible to get light and ventilation, however, to make such areas useful, and it is the architect's function to plan for this. To emphasize the value of width of lot, let me briefly draw attention to another type of plan shown in



Commercial Trust Co., New Britain, Conn.



Fig. 1. Bank on a Steep, Sloping Site

Fig. 2 (New Britain). Both these plans provide an area at the side, which gives space for a low work room, or machine room at the main banking floor level, and allows both light and ventilation for the main banking room. This is interesting and convenient bank construction, but it requires a lot at least 50 feet wide. This is a minimum and a mean minimum; from 55 to 60 feet it should be. Every foot added to the width of this type of plan is doubly important, since it may be used to increase either the public space or the working area.

Another interesting possibility of a wide lot is that of future expansion. In Fig. 8, showing the minimum width of 40 feet, the only way the screened area can be increased is by extending it back, sometimes an awkward alternative. If the lot were 18 feet wider (58 feet), the screen could be extended as shown in Fig. 10. This is called a "single expansion of the screen." If the lot were 35 feet wider (75 feet), a double expansion could be made, as in the bank at Trenton (Fig. 11). This rearrangement is very easily accomplished if the screen is built for it at the start. The difficulty of future expansion is never in constructing a screen so that it may be easily changed; it is always in the lack of floor area in which to expand it. All the foregoing has been written with the plan shown in Fig. 8 as a basis; that is, a central public space with the screen running down each side;—the "horseshoe" or "U" plan, so called. In lots narrower than 40 feet, particularly where fewer wickets will be required, the single screen is the only possible solution. This arrangement is particularly adapted to the smaller bank, and when carried out in connection with the machine room as shown in the bank at Homestead (Fig. 4), it is eminently satisfactory.

So much for confines; now for contours. The level site is usual and, as a general thing, it makes comfortable designing for the architect and simplifies this problem for the banker and his clients; but sometimes there is a stiff difference in levels which has to be reckoned with. My memories of the

great Keystone state, also a great bank building state, are very vivid as to levels. Here the flat site is so rare that I think it is almost safe to say that one does not exist. When the lot, rising sharply toward the back, pushes the building into a hill, it creates perhaps, the most awkward condition possible. But being an optimist, I can see good even in this, for the gradual elevation of the sidewalk permits the man in the street to get a better view of the bank's interior, which all bankers want. The rise of the sidewalk against the outside wall, therefore, provides a practical advertising advantage, but the difficulty is to take full advantage of it without sacrificing the architecture. Many designers frankly give the problem up and declare it to be impossible. But, personally, I have always been unwilling to admit defeat, for I think the architect should, and can, meet every practical requirement and still create a fine architectural effect. Fig 1 shows a solution of such a problem, which I believe to be successful, and, as I recall it, there was a difference between front and rear levels of some 10 or 12 feet. Where the lot falls away at the back, the architectural problem is much simpler. In fact to such a site there are distinct advantages, since a basement entirely or even half above ground secures better light and ventilation to the several departments which are frequently better below than on the main floor. A drop in the rear of the lot once made it possible to gain easy access to the basement of a large bank and office building. A garage for the storage of 100 cars was put there, and this convenience did more than any other one thing to rent quickly, in a city already overbuilt in office space, the hundred odd offices above. The garage paid for itself many times over.

But as I have already observed, architects are not often consulted in the selection of sites, though the importance of the site is paramount. I may say, that seldom does an important real estate transaction go through in one of the great cities until the prospective owner knows exactly what kind of a building he can put upon the property he proposes to buy;—



Commercial Trust Co., New Britain, Conn.



Fig. 3. First National Bank & Trust Co., Monessen, Pa.

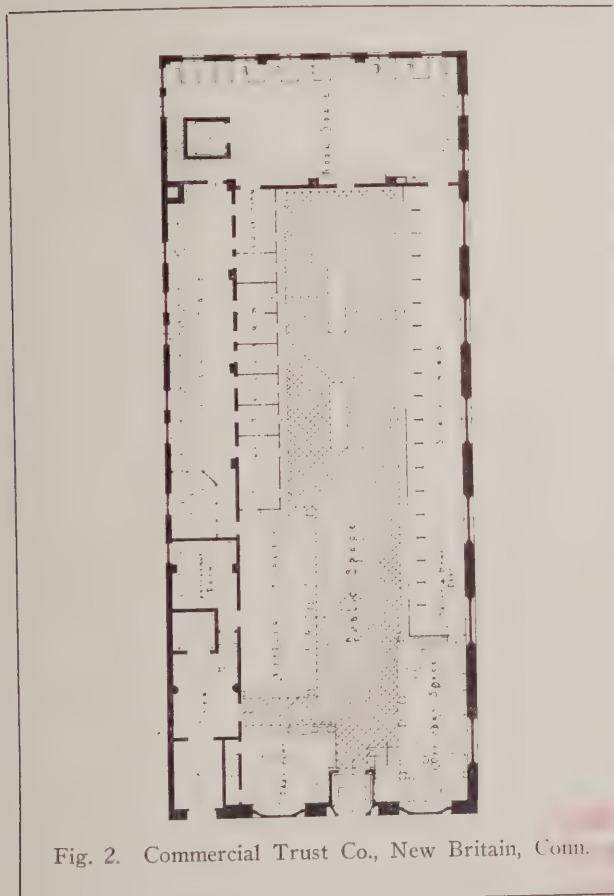


Fig. 2. Commercial Trust Co., New Britain, Conn.

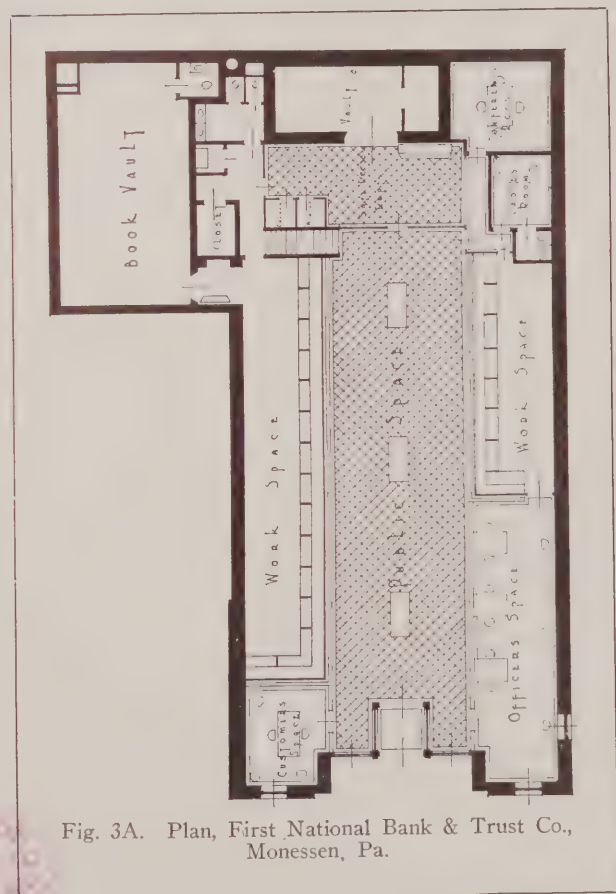


Fig. 3A. Plan, First National Bank & Trust Co., Monessen, Pa.



Interior Facing Entrance



Banking Room

Commercial Trust Co., New Britain, Conn.

and he wants this information *before* his purchase and not *after* it. If two sites are available and under consideration, then is the time to select one's architect and try out the advantages or disadvantages of each by the comparison of careful planning; in this way only will it be possible to determine definitely their relative values. It sometimes happens that the main consideration in a choice between two properties has to do with the cost involved, rather than with their respective suitability as building sites. Here is the story of a banker whom I found in just such a dilemma. Several years ago I called on him with respect to a new building. I found him huddled up in his old quarters, in great confusion, and with everybody on top of everybody else. He had taken over an old store as an annex, and a screen knocked together out of sheathing and window glass housed his trust and savings departments. He wanted to build, but of two sites available he could not tell which he preferred or could better afford. Though

I wanted very much to do so, I did not tell him the story of the celebrated jackass that died of starvation between two bundles of hay because he did not know which one to eat. Nor did I undertake to tell him which was the better site, because he intimated that that was a matter no one but himself could decide. So I departed, leaving him to formulate his own conclusion. Not so long ago, but two years after my first visit, I was passing through his town (in western Pennsylvania) and stopped off to see him. Same old place, same old confusion, same old system of everybody on top of everybody else. But he remembered my previous call pleasantly, greeted me cheerily, and when I wanted to know how the new bank building was getting on, he said it wasn't getting on at all. He still had to decide where he was going to build; whether he would stay on his present corner or move across the street. Again, I wanted to tell him the story of the jackass, and came to the very verge of it, but refrained. We were soon out

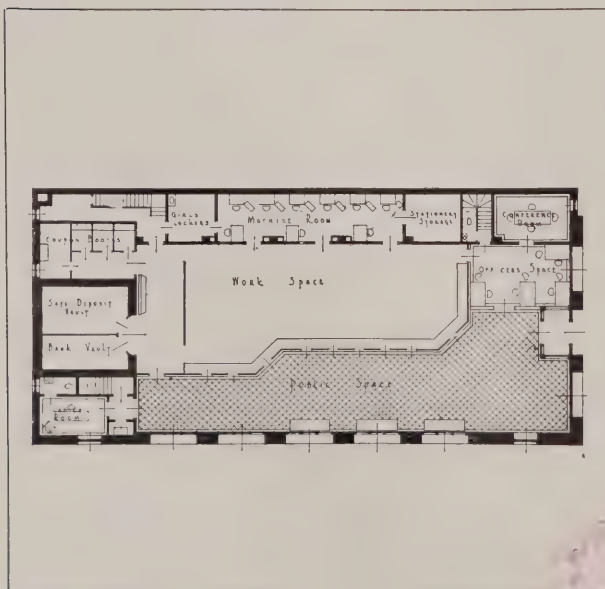


Fig. 4. Plan, First National Bank, Homestead, Pa.

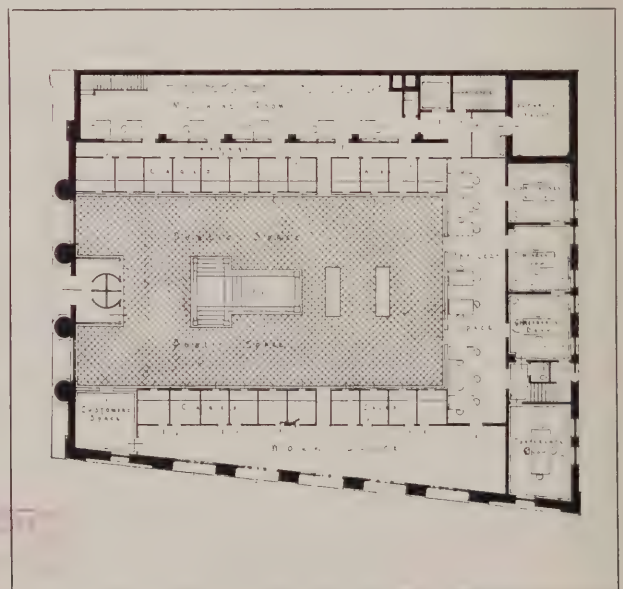
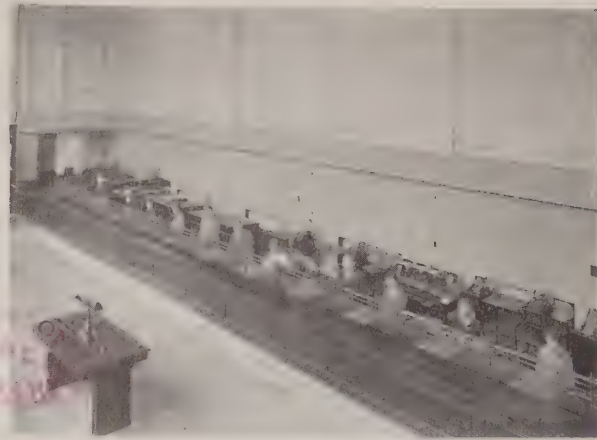


Fig. 5. Plan, Monongahela Trust Co., Homestead, Pa.



Dime Savings Bank, Akron, O.



First National Bank, Monessen, Pa.

upon the street, however, going over the two properties. There was no doubt as to which was the better, nor was there any doubt as to which would cost the more. So I said to him, "The crux of this whole matter is, how much more you are willing to pay for the best place to have a bank." I thereupon ventured the opinion that \$50,000 would not be too great a sum. "Is not a bank on this corner worth \$3,000 a year to you?" I asked, for by this time we were standing before it. He replied instantly, "It seems to me \$3,000 a year is very little to pay to have a big billboard on the best corner in town. A bank is only a billboard, isn't it?" "That's just what it is," I replied. "A bank building is advertising,—the best kind of advertising. And speaking of advertising," I said, "how much do you spend?" "\$12,000 a year." "How?" "Billboards and newspapers." "Well," said I, "here's another point of view. If you wanted to concentrate half your present advertising budget on the 'best corner in town,'

you could pay \$100,000 more for that corner, and not have your advertising cost more than it does now, and would not advertising on the best corner in town, as you propose to do it by a new building, be worth a good half of all the advertising you are now doing?" Bankers being conservative, he did not commit himself. So I went on. "I know by spending \$100,000 more, you are mortgaged for \$6,000 interest a year forever. But! You have already been on this corner for 20 years, and you are going to be here for 20 years more. Please think how much smaller a similar \$6,000 expended 20 years ago would look to you now than it did then. During 20 years this same \$6,000 we are now discussing will dwindle with each passing year. I can promise you that when you see a real bank building on that corner and find yourself doing business in it, you will feel this \$6,000 to be the best advertising you have ever done." Bankers being conservative, we did not then decide the matter. But after I had drawn a

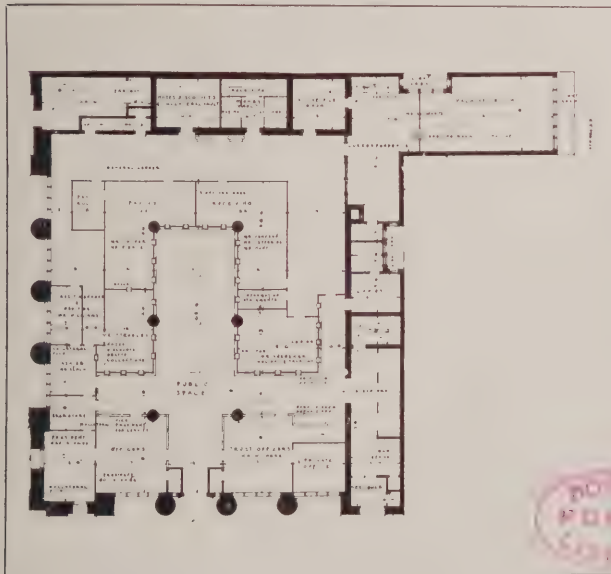


Fig. 6. Plan "A"; 27 Wickets

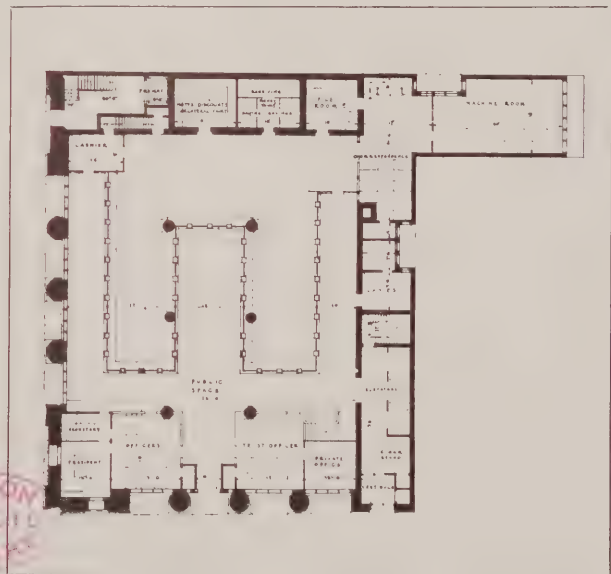
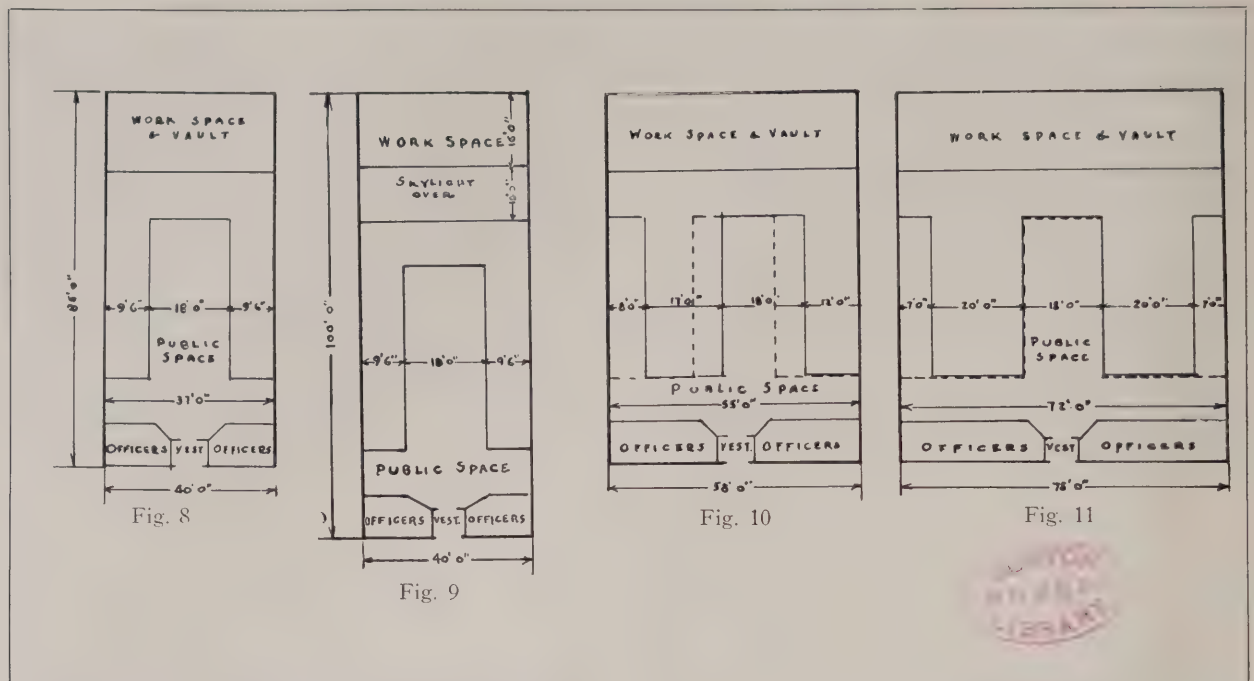


Fig. 7. Plan "B"; 42 Wickets

Plans of an Actual Project, Plan "A," to Be Built at Present, and Plan "B," Providing 15 Wickets for Future Expansion



Plans Showing Minimum Sizes of Banks on Interior Lots

Solid Lines Show Future Expansion of Screens

further picture of what might be built "on the best corner in town," we went to look once more at the other corner, and we found it looking like nothing at all. But we had made progress toward a real decision, my banker friend and I. And I know exactly how the matter is coming out and said so; but he, being a banker, and more conservative, did not commit himself. In the meantime I am wondering just how and when and where I am going to tell him that story about the jackass!

And right here I want to say how very important a good location for a bank is. I am sure every banker realizes that quite as much as I do, but every once in a while I see a bank in an out of the way place, struggling along on a poorly situated corner, and my heart goes out to those who are working so conscientiously under a needless handicap,—having no happy place in the sun. So I am stressing how vital is that place, and how necessary it is for the banker to screw his courage up to the sticking point and pay the price to get it. A successful banker exclaimed to me once: "What has a bank to sell except service!" A convenient location for its clientele is just as much "service" as any other accommodation, which the bank is glad to provide. The bank long ago found out the value of the golden rule as a means of securing business; that the best location for its customers is the best location for itself. In fact, with respect to location, I have never heard higher optimism expressed or a keener appreciation of what a good site will do in the way of increasing business than that uttered by my recent friend with his breezy phrase: "A big billboard on the best corner in town."

Selecting the type of plan best suited for individual requirements is always interesting, and it be-

comes more and more so to those who have studied and continue to study the problem of bank design. Over a long period of years I have watched with keen interest the banker's approach and criticism of the various forms of bank plan the architect has devised for him. For, after all, it is to the opinions of those who use what he has planned that the architect must look for a final judgment.

Bankers are now entirely conversant with the "island" plan and the "horseshoe" or "U" plan—(both illustrated on page 838). The latter plan has stood the test of time and stood it well;—the screen on each side, and the great vault door in the center, where everyone can see it. This arrangement has the advantage of symmetry, certainly. But the vault is found very much in the way when it comes time to enlarge it, and its location here interrupts the communication between departments behind the screen. But the U-plan has many advantages. It focuses the attention of the bank's personnel upon the public when it may better direct it and serve it. In the U-plan there is not only a certain sense of safety but a practical advantage in security, for anyone attempting a holdup would have to start that precarious performance in a position which would permit the bank's force to take him upon both flanks at once. I have no doubt that this fact has deterred many a holdup man from practicing his trade in banks with the U-plan. With these practical advantages to its credit, the U-plan has also a fair edge over every other variety of plan in its sightliness. It obstructs the view less;—in fact it obstructs it not at all. Patrons, on entering, see at once the entire length of the bank's interior.

I remember once talking with members of a building committee who were plying me with questions at

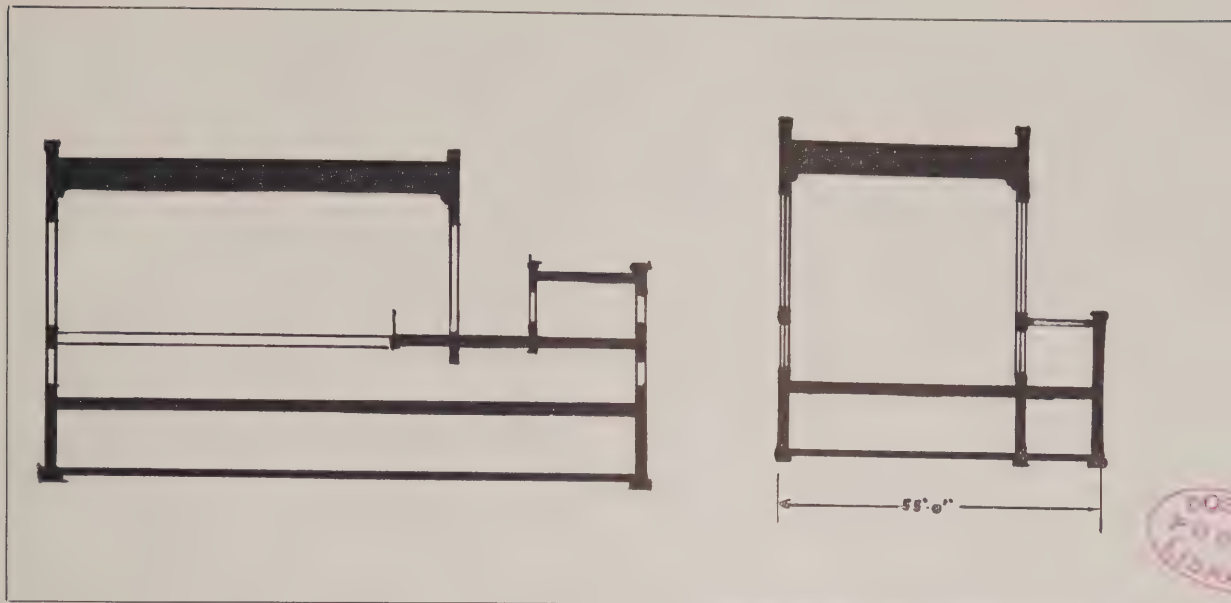


Fig. 9A

Longitudinal Section Through Plan Shown in Fig. 9 with Light Court at Rear

Fig. 2A

Cross Section Showing Light Court at Side Next to Adjoining Property. For Plan See Fig. 2

a great rate. I was negotiating for the work, and they were giving me every kind of a test but a blood test. There came a lull in the examination, which had been severe, and which had left me dazed and breathless. Quite unexpectedly, the chairman came suddenly to life and, gathering himself up, he looked me squarely in the eye and said, with an "I've-got-you-now" tone in his voice: "Mr. Hopkins! How wide should a public space be?" "18 feet is a very decent minimum; 20 feet is comfortable; 22 feet is excellent; and 24 feet perfect," I replied. And I said it with such promptness and decision that the utterance surprised both of us. It was a good enough answer, and he never forgot it,—for it came up to pester me at many subsequent meetings. But I stuck to my rule, which resulted finally in the purchase of the next lot, when we were able to have a public space of 26 feet in width. The public space shown in the fine room of the Monongahela Trust Co., Homestead, Pa. (Fig. 5) is 40 feet in width. There is nothing like a broad public area, especially for a large bank.

The width occupied by the counter and the cages all depends upon circumstances, principally the circumstance of the width of the lot and how much the banker wants to bank. I have given 9 feet, 6 inches as a minimum. This allows 2 feet, 6 inches for the counter, 4 feet for the depth of the cage, and 3 feet for the passage behind it. If rear counters are desired, then 2 feet must be added to the depth of the cage, making it 11 feet, 6 inches from the front of the counter to the wall. In Fig. 2, the passageway behind the tellers' cages has been omitted. The cages enter directly into the work room, a system of planning which adds 3 feet of usable public space the entire length of the screen;—no inconsiderable amount, as every banker and architect well know.

But I will let the details of planning go until a later chapter, and we will leave the U-plan at this point and turn to another variety,—the "island" plan. The island plan is certainly convenient for the bank,—there is no question about that,—but it is inconvenient for the public. Customers are obliged to wander around a circumference looking for various holes in the screen through which they may do business; and incidentally, we are told that when the human mind has lost the sense of direction it causes the body to travel in circles. Why start the body on a circuit, which if persisted in may very soon affect the mind? The island plan was devised during that lamented period, now long since past, in which the "public-be-damned" spirit crept a little way into even the staid, conciliatory soul of the banker, and made him think more of his own convenience than of that of his clientele. That type of plan seems now to have gone with the spirit of its day, and the "half-island" plan (Fig. 4) has taken its place. For the smaller institution, especially, and in many cases the larger bank as well, this type has a great advantage. There is no interruption in the communication between departments on the bank's side, and there is no difficulty either in the convenience or in the control of the public on the public's side. With qualifications, it has none of the disadvantages of either the U-plan or the island plan, and it possesses the advantages of both.

There is still another type,—or arrangement,—that one sometimes finds in the larger institutions, and that is an island space for the officers, the screen being placed around them on all sides. I have always felt that this herding of the officers into a central bull pen was undignified, and is certainly lacking not only in actual privacy, but in every seeming indication of it. And this brings up an im-

portant and a frequently debated detail,—where should the officers be located? It is interesting to note the change in attitude of those estimable gentlemen as to just where is the most suitable and convenient place for having their contacts with the public. In the old days, the bank president received his callers in seclusion at a remote corner in his institution. Latterly, the thought has been to give him and the other officers a position of the utmost prominence, actually as near the front door as is possible. I have even heard the president of a near-billion-dollar institution say that he could get through more work in a day out in the open than he ever could in his old private office. And he gave several very convincing reasons just why this was so. This opinion has been generally held throughout the last decade. But putting the officers at the front entrance, while “humanizing the bank,” as we used to say, makes the officers sometimes entirely too accessible. It is true that here they may greet the old customer and welcome the new, but these hospitable and agreeable civilities, and others incident thereto, frequently take more time and cause more interruption to actual business than they are worth.

Let us commence by considering the convenience of the greatest number of the bank's clients. Do more consult the officers, or do more deal directly with the tellers? Certainly the latter condition obtains in every instance. Then put the screen to the very front, so that the bulk of the traffic may come in, transact its business as speedily as may be, and go out. Keep the in-and-out customers as near the entrance as possible. This is sound logic and good banking. The plan shown in Fig. 5 was designed upon this theory. With the front taken up by routine business, the best place left for the officers is at the end of the public space, certainly a convenient and dignified position. Well lighted private offices adjoin. And one great advantage of putting the officers at the back is the ease and convenience with which private offices may be provided for them, though only where there is natural light at this point. The private office is always difficult to manage if placed forward. Either a front window has to be taken for it, or else it must be incorporated in the screen. This can be done conveniently enough with the present high screen, but if I can foretell the future in bank design with any degree of accuracy, the high screen will eventually be discarded in favor of the low counter. Then the already difficult task of providing suitable private offices at the front of the banking room will be made more difficult still.

A type of structure which gives naturally a place for private offices at the front is that shown in Fig. 2. I have already referred to this elsewhere, but I do so again because it is a type which I have developed, and every parent is entitled to be a little foolish about his favorite child. A bank building constructed upon this plan has distinct advantages. It gives light and ventilation at a usually dark, unventilated side; it provides an enclosed machine room

at the most convenient point, directly behind the tellers; it leaves a natural place for a private office at the front, and it does all this without losing a foot of the lot's area. Then it does something else. It provides an area outside of the main banking room which may be divided into low mezzanines, very suitable for additional private offices or consultation rooms. Or, if these are not wanted, the space may be used for storing inactive files or for any of the purposes which the basement is usually put to. The cellarage is always the least desirable floor area, and one of the first requisites of bank building is the development of mezzanine floors which will take out of it the locker rooms, file rooms, etc. formerly put there. But this system of planning decreases the width of the main banking room, and I occasionally have someone overrule me on this account. But it is unwise judgment. Narrow rooms are always dignified, and there is no reason to object to such proportions on æsthetic grounds. Besides, there is less cubic content to heat and to pay for; less wall to construct, to decorate and to clean; and these are all tangible economies.

And now with several varieties of plans set forth, which should be chosen? That choice is not always left to the architect. The banker generally has a pretty clear idea of the kind of bank he wants to do business in. The old adage which declares that what is one man's meat is another man's poison is applicable to many things besides his food! It is even applicable to bank plans. I was once greeted with the positive assertion, by a highly respected and irascible banking brother, that he could plan a better bank than any architect, and he did,—and I built it;—which is another story, and a good one. But when I have my way, I suggest for the smaller institution, a plan on the lines of Fig. 4,—the half-island plan. It provides the maximum convenience for the bank and everything necessary for the public. It does not lend itself to expansion, to be sure, and so it must be conceived at the start on an adequate scale. But for every other requirement it is excellent, and for the smaller bank I doubt whether it is possible to develop the structure further except in detail. For the large, growing and important institution, Fig. 2 shows an excellent type. It provides every present convenience and every possibility of future expansion within a given lot area. The value of the form of its structure I have already noted. Its suitability for the busy bank I shall now briefly recapitulate. The double screen gives the maximum opportunity of contact with the public,—the savings bank on one side, with the commercial bank, adjoining the machine room, on the other. With two mezzanines at the rear there is an excellent floor area provided for future expansion;—floor area that may be utilized either for additional officers' space or for the clerical force. But this plan should be developed upon a corner lot at least 55 feet wide and 115 feet deep. With this lot area, here is the perfect plan for the active, constructive, expanding institution.



GENERAL VIEW



MAIN BANKING ROOM



Photos. Mott Studios

CORNER OF MAIN LOBBY



PRESIDENT'S OFFICE

Plans on Back

THE PACIFIC NATIONAL BANK, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Skeleton steel and concrete slab construction; hollow tile partitions.

Exterior Materials: Brick and terra cotta, with granite base.

Interior Materials: Marble floors; imitation travertine walls.

Windows: Double; plate glass.

Counter Screens: Cast travertine.

Vault and Safe Deposit Provision: Reinforced concrete vaults.

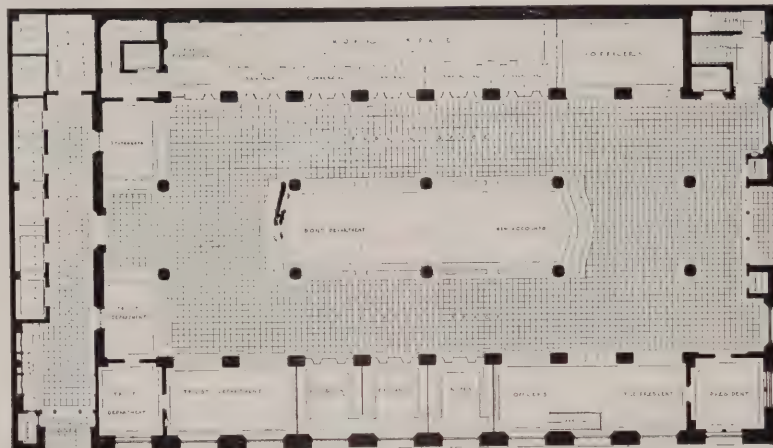
Type of Lighting: Indirect.

Heating and Ventilating: Steam heat and washed air ventilation.

Date of Contract: April, 1925.

Total Cost of Building: \$1,445,000.

Cubic Foot Cost: 58 cents.



FIRST FLOOR



BASEMENT

PLANS, THE PACIFIC NATIONAL BANK, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS





ELEVATOR LOBBY



GENERAL VIEW



Photos. Herbert R. Fitch
BANKING ROOM



PUBLIC SPACE

Plan on Back

SAN DIEGO TRUST & SAVINGS BANK
WILLIAM TEMPLETON JOHNSON, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction: Steel frame.

Exterior Materials: First two stories sandstone;
remainder, terra cotta.

Interior Materials. Marble, bronze, cast stone
and iron.

Windows: Plate glass with metal frames and
sash.

Counter Screens: Marble, with bronze and plate
glass.

Vault and Safe Deposit Provision: Security and
storage vaults with up-to-date standard equip-
ment.

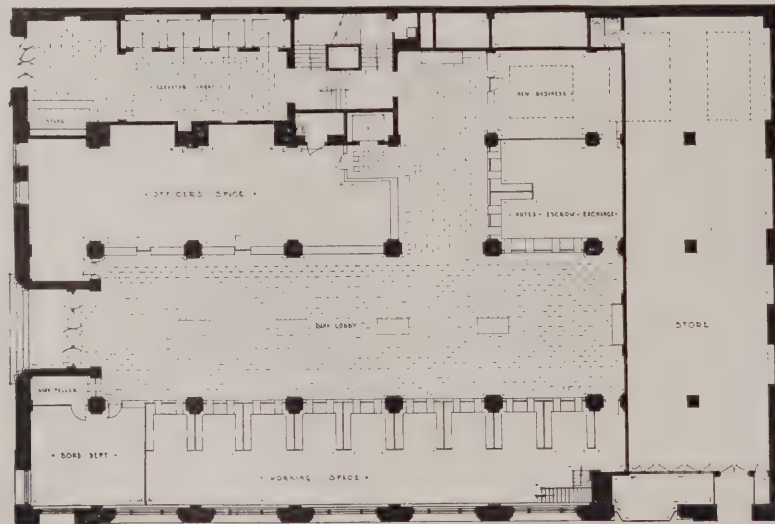
Type of Lighting: Especially designed.

Heating and Ventilating: Direct steam heat, with
a complete system of ventilation.

Date of Contract: March, 1927.

Total Building Cost: \$1,400,000, exclusive of
banking equipment.

Cubic Foot Cost: 59.4 cents.



PLAN, SAN DIEGO TRUST & SAVINGS BANK

WILLIAM TEMPLETON JOHNSON, ARCHITECT



MAIN ENTRANCE



PERSPECTIVE



PUBLIC SPACE AND SCREEN



PART OF BANKING ROOM

Plan on Back

SEAMEN'S BANK FOR SAVINGS, NEW YORK
BENJAMIN WISTAR MORRIS, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction: Steel; short-span cinder concrete arches.

Interior Materials: Stone, marble, wrought iron; bronze; plaster and wood.

Exterior Materials: Granite; cast stone; marble and brick.

Windows: Steel.

Counter Screen: Marble and wrought iron.

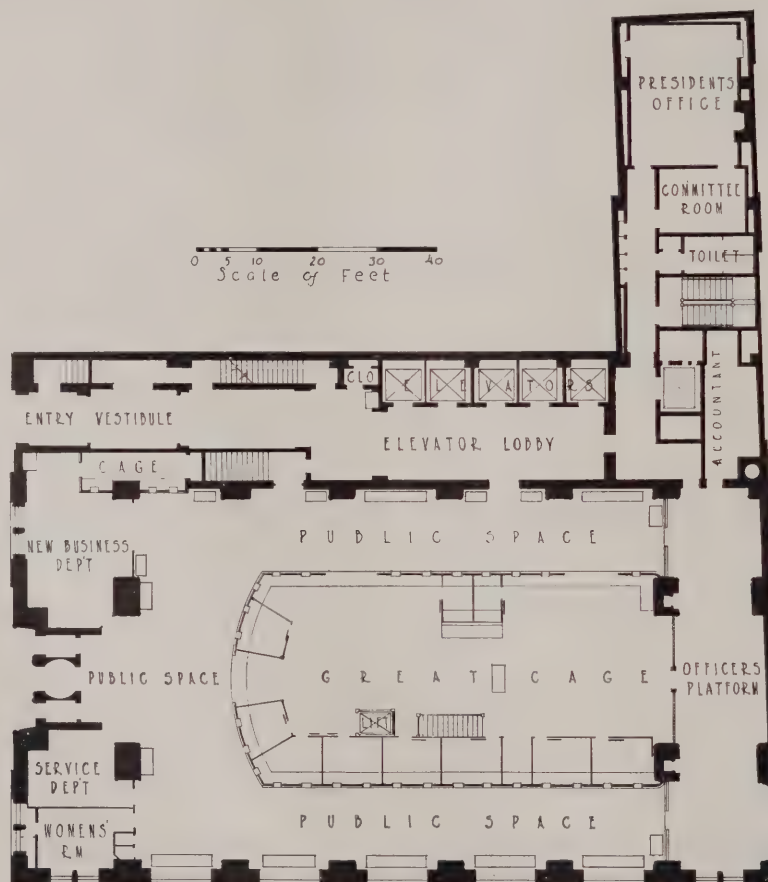
Vault and Safe Deposit Provision: Security and safe deposit vaults.

Type of Lighting: Direct and semi-direct.

Heating and Ventilating: Steam heat; exhaust ventilation.

Date of Contract: December 21, 1925.

Cubic Foot Cost: 89.5 cents, based on cost including vaults, but exclusive of tenant alterations and architect's and engineer's fees.



PLAN, SEAMEN'S BANK FOR SAVINGS, NEW YORK
BENJAMIN WISTAR MORRIS, ARCHITECT



GENERAL VIEW



MAIN FACADE



Plan on Back

Photos. Thomas Ellison

BANKING ROOM
SECOND NATIONAL BANK, SAGINAW, MICH.
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Concrete foundations; steel frame; concrete fireproofing and floor slabs; brick curtain walls.

Exterior Materials: Granite base; lower stories limestone; upper stories face brick; terra cotta trimming.

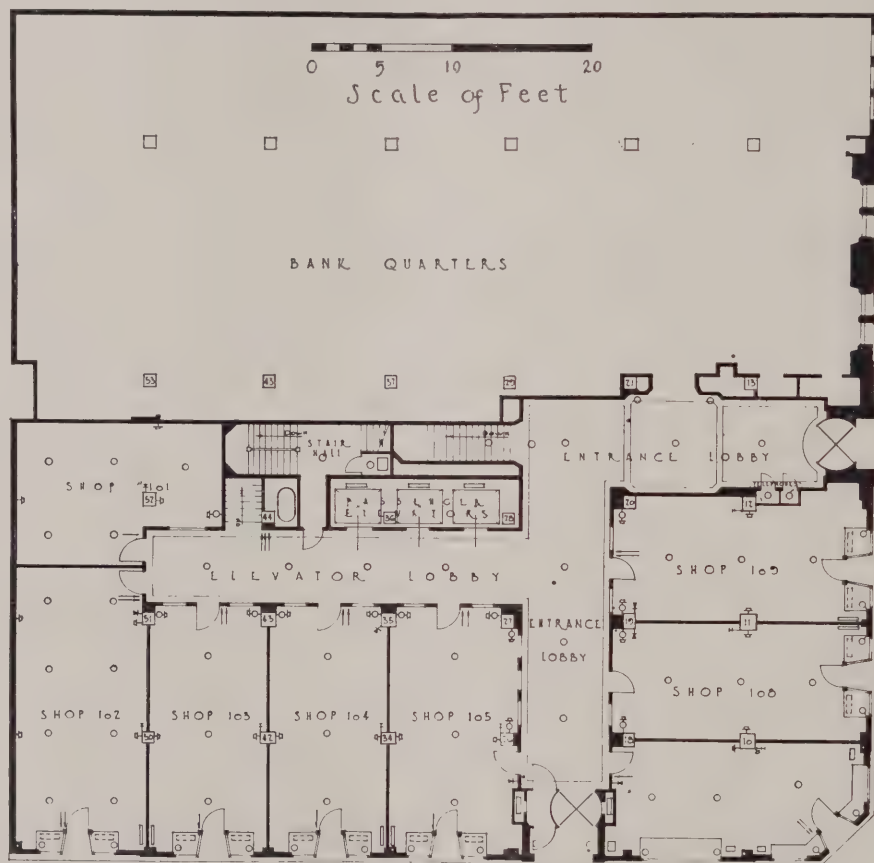
Interior Materials: Marble floors and wainscots.

Windows: Ornamental cast iron in street fronts.

Counter Screens: Marble, wrought iron and glass.

Vault and Safe Deposit Provision: Money, safe deposit and book vaults.

Heating and Ventilating: Direct radiation steam heat; reversible system of ventilation.



PLAN, SECOND NATIONAL BANK, SAGINAW, MICH.

SMITH, HINCHMAN & GRYLLS, ARCHITECTS



ENTRANCE DETAIL



GENERAL VIEW



Photos. Tebbs & Knell, Inc.

GENERAL INTERIOR



OFFICERS' SPACE

Plan on Back

CANAL BANK & TRUST CO., NEW ORLEANS
EMILE WEIL, INC., ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Steel frame; hollow tile floor arches.

Exterior Materials: Indiana limestone front; pressed brick and stone trim elsewhere.

Interior Materials: Marble wainscot and floors; mahogany trim.

Windows: Steel frames and sash.

Counter Screens: Marble and bronze.

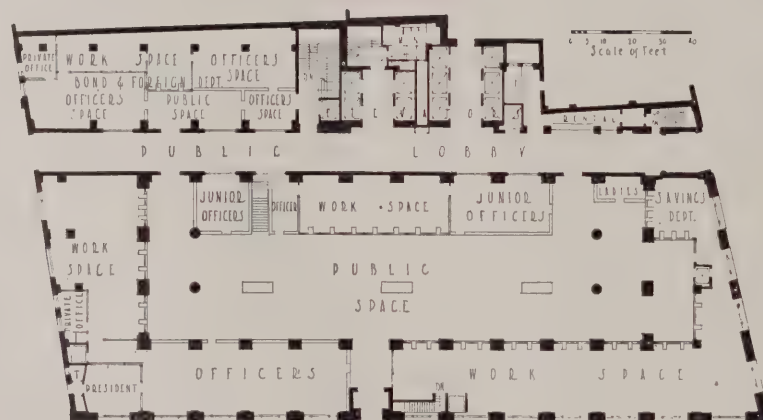
Type of Lighting: Direct.

Heating and Ventilating: Steam heat; forced ventilation.

Date of Contract: March 3, 1926.

Total Building Cost: Approximately \$5,000,000.

Cubic Foot Cost: About 75 cents.



PLAN, CANAL BANK & TRUST CO., NEW ORLEANS
EMILE WEIL, INC., ARCHITECTS



BUHL BUILDING



BANK ENTRANCE



Photos. Thomas Ellison

Plan on Back

BANKING QUARTERS
GUARDIAN TRUST CO., DETROIT
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

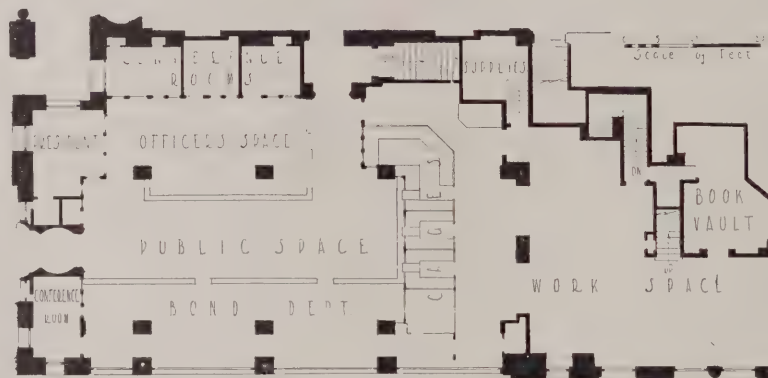
CONSTRUCTION DATA

Interior Materials: Marble floor; wood and marble wainscots; ornamented plaster ceiling.

Windows: Ornamental steel.

Counter Screens: Wood and marble.

Vault and Safe Deposit Provision: Safe deposit, security and archive vaults.



PLAN, GUARDIAN TRUST CO., DETROIT

SMITH, HINCHMAN & GRYLLS, ARCHITECTS





GENERAL VIEW



ELEVATOR LOBBY



BANKING ROOM

Plan on Back

Photos. Thomas Ellison

GRAND RAPIDS TRUST CO.
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Concrete foundations;
steel frame, concrete fireproofing and floors;
brick curtain walls.

Exterior Materials: Granite base; terra cotta
facings.

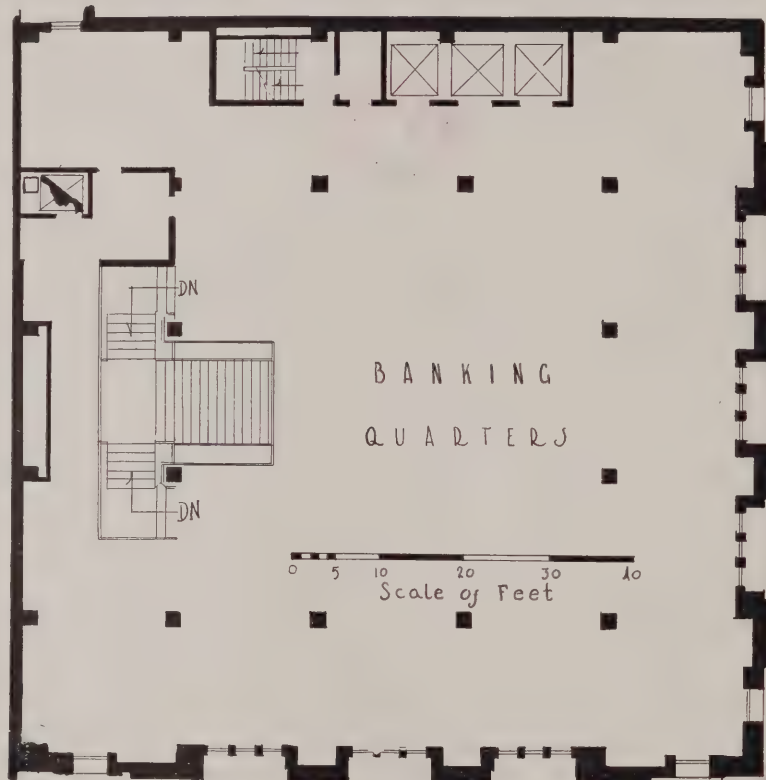
Interior Materials: Marble floor and base;
plaster walls and ceiling.

Windows: Cast iron and bronze.

Counter Screens: Marble and bronze.

Vault and Safe Deposit Provision: Security,
archive and safe deposit vaults.

Heating: Direct steam.



PLAN, GRAND RAPIDS TRUST CO.
SMITH, HINCHMAN & GRYLLS, ARCHITECTS



GENERAL VIEW



INTERIOR



Photos. George W. Van Anda

BANK ENTRANCE



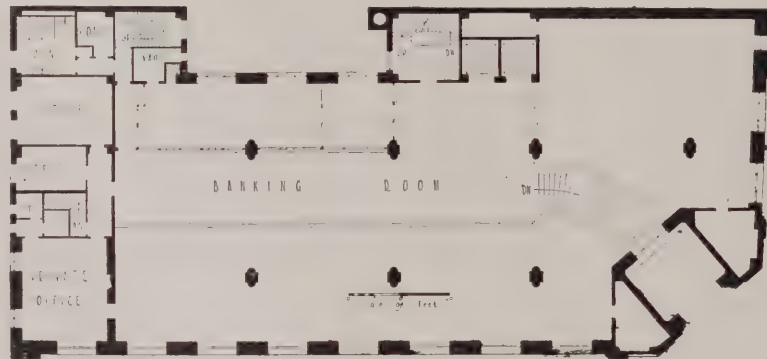
Plan on Back

SIDE ENTRANCE

LAWYERS TITLE & GUARANTY COMPANY, WHITE PLAINS, N. Y.
ANDREW J. THOMAS, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction: Fireproof.
Exterior Materials: Cast stone and face brick.
Interior Materials: Wood doors and trim; remainder fireproof.
Windows: Metal frames and sash.
Counter Screens: Marble and wrought iron.
Type of Lighting: Direct.
Heating and Ventilating: Vacuum system.
Year of Contract: 1926.
Total Building Cost: \$600,000.



LAWYERS TITLE & GUARANTY TRUST CO., WHITE PLAINS, N. Y.
ANDREW J. THOMAS, ARCHITECT



STREET FACADE



Photos. Paul J. Weber

ENTRANCE VESTIBULE



Plan on Back

BANKING QUARTERS

KEENE NATIONAL BANK, KEENE, N. H.
HUTCHINS & FRENCH, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Fireproof.

Exterior Materials: Face brick and limestone trim.

Interior Materials: Marble and wood.

Windows: Solid rolled steel sections.

Counter Screens: Marble and painted iron.

Vault and Safe Deposit Provision: Electrically-protected safe deposit, security, book and storage vaults.

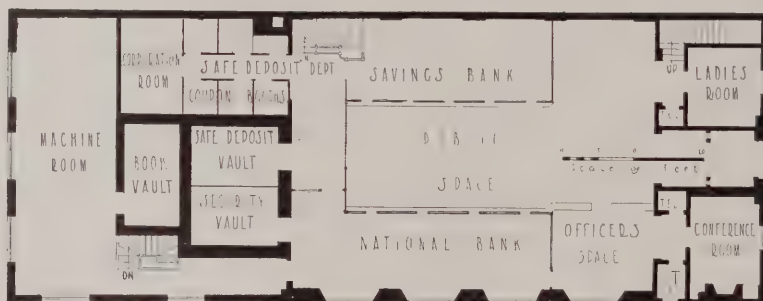
Type of Lighting: Indirect electric.

Heating: Vapor system.

Date of Contract: July 30, 1926.

Total Building Cost: \$150,000.

Cubic Foot Cost: 95 cents



PLAN, KEENE NATIONAL BANK, KEENE, N. H.
HUTCHINS & FRENCH, ARCHITECTS



GENERAL VIEW



Plan on Back

BANKING ROOM
HUBBARD WOODS TRUST CO., HUBBARD WOODS, ILL.
WILLIAM SPENCER CROSBY, ARCHITECT

CONSTRUCTION DATA

Type of Construction: Steel and concrete.

Exterior Materials: Stone and brick.

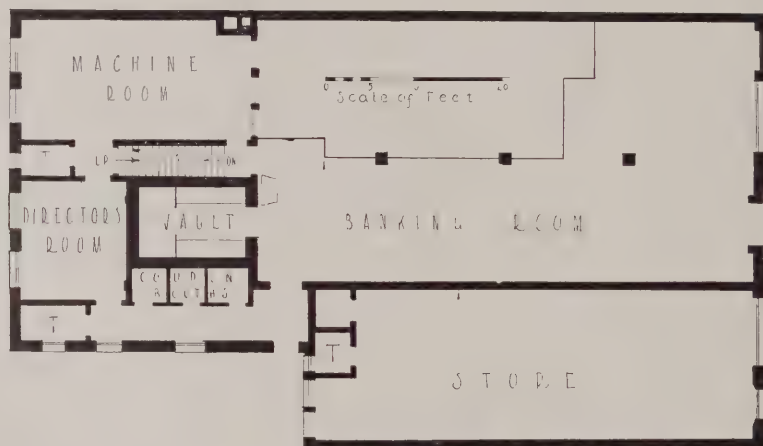
Interior Materials: Wood trim; plaster walls and ceiling; marble floors.

Windows: Wood and metal.

Counter Screens: Marble.

Type of Lighting: Direct electric.

Heating and Ventilating: Hot water heat; exhaust ventilation.



PLAN, HUBBARD WOODS TRUST CO., HUBBARD WOODS, ILL.

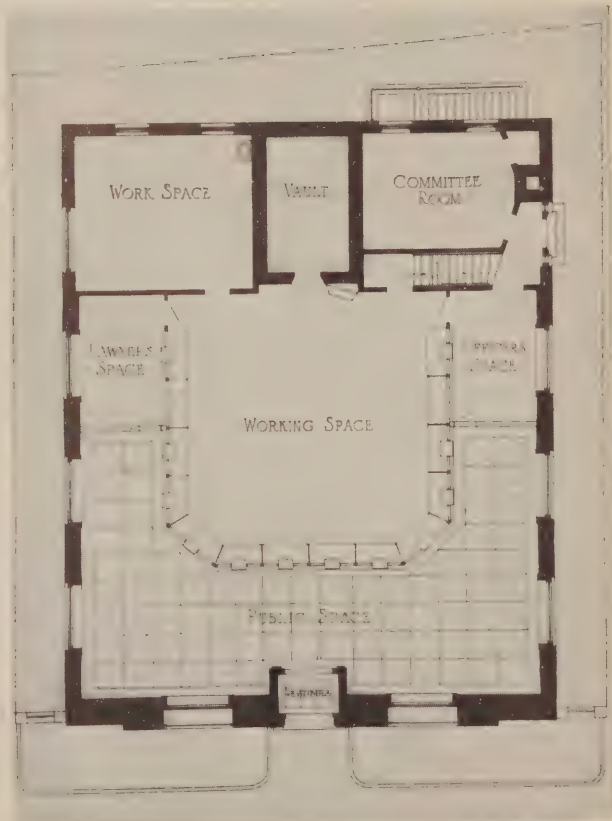
WILLIAM SPENCER CROSBY, ARCHITECT



GENERAL VIEW



Photos. Paul J. Weber



PLAN

ENTRANCE

WOBURN CO-OPERATIVE BANK, WOBURN, MASS.

JOSEPH D. LELAND & COMPANY, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Semi-fireproof.
Exterior Materials: Brick and limestone.
Interior Materials: Terrazzo floor; plaster walls
and ceilings; wood trim.
Windows: Wood, double-hung.
Counter Screens: Wood, glass and wrought iron.
Vault and Safe Deposit Provision: Security and
bank vaults.
Type of Lighting: Direct electric lighting.
Heating and Ventilating: Vapor steam.
Date of Contract: September, 1926.
Total Building Cost: \$57,600.
Cubic Foot Cost: 51.7 cents.

WOBURN CO-OPERATIVE BANK, WOBURN, MASS.
JOSEPH D. LELAND & COMPANY, ARCHITECTS



GENERAL VIEW



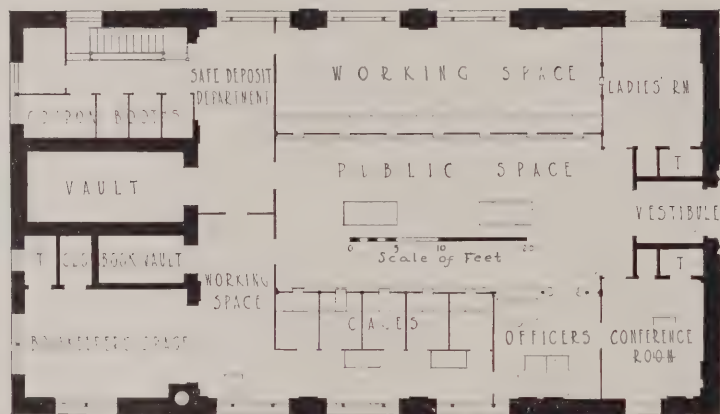
Photos. Louis H. Dreyer

Plan on Back

BANKING ROOM
BANK OF NUTLEY, NUTLEY, N. J.
HOLMES & WINSLOW, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Fireproof.
Exterior Materials: Face brick and limestone.
Interior Materials: Marble, bronze, and terrazzo.
Windows: Steel.
Counter Screens: Marble, bronze and mahogany.
Type of Lighting: Direct electric.
Heating: Vapor vacuum heat.
Date of Contract: August 19, 1925.
Total Building Cost: \$147,500.
Cubic Foot Cost: 93 cents.



BANK OF NUTLEY, NUTLEY, N. J.
HOLMES & WINSLOW, ARCHITECTS



ENTRANCE DETAIL



Photos. Frances Benjamin Johnston

Plans on Back

GENERAL VIEW
HYANNIS TRUST CO., HYANNIS, MASS.
J. WILLIAMS BEAL SONS, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Masonry walls; concrete floor slabs; wood roof construction.

Exterior Materials: Granite base course; brick walls with limestone trim.

Interior Materials: Gypsum block partitions; plaster walls; mahogany trim; marble and linoleum floors.

Windows: Double-hung wood in banking room; steel casements elsewhere.

Counter Screens: Mahogany, with bronze grilles.

Vault and Safe Deposit Provision: Security door and day gate; safe deposit boxes.

Heating: Two-pipe direct steam.

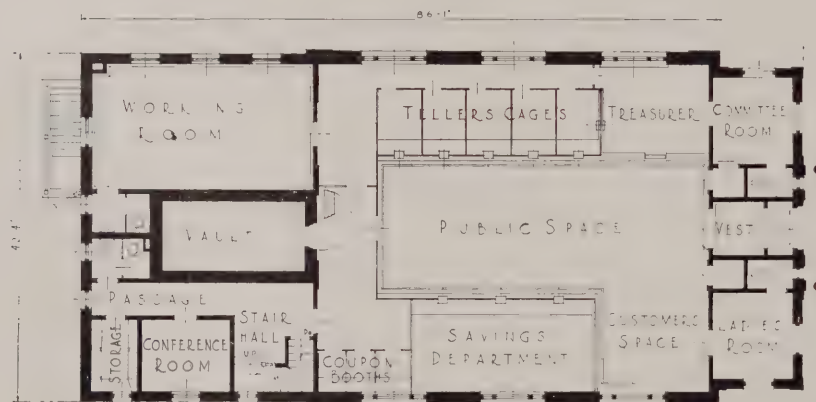
Date of Contract: March 26, 1923.

Total Building Cost: \$98,859.

Cubic Foot Cost: 82 cents.



MEZZANINE FLOOR
SCALE OF FEET



FIRST FLOOR
SCALE OF FEET

PLANS, HYANNIS TRUST CO., HYANNIS, MASS.
J. WILLIAMS BEAL SONS, ARCHITECTS



GENERAL VIEW



Plans on Back

Photos. W. H. Goldenblum

BANKING ROOM
HAMDEN BANK AND TRUST CO., HAMDEN, CONN.
NORTON & TOWNSEND, ARCHITECTS

COST AND CONSTRUCTION DATA

Type of Construction: Masonry walls and concrete floor, with wood roof timbers.

Exterior Materials: Cast stone.

Interior Materials: Rubber tile floor; walnut trim.

Counter Screen: Marble; composition panel; glass top and bronze grille.

Vault and Safe Deposit Provision: Steel-lined, electrically-protected vault.

Total Cost of Building: \$78,000, equipped.



MEZZANINE FLOOR



FIRST FLOOR

PLANS, HAMDEN BANK AND TRUST CO., HAMDEN, CONN.

NORTON & TOWNSEND, ARCHITECTS



GENERAL VIEW



Photos. Amemys

BANKING ROOM



ENTRANCE DETAIL

Plans on Back

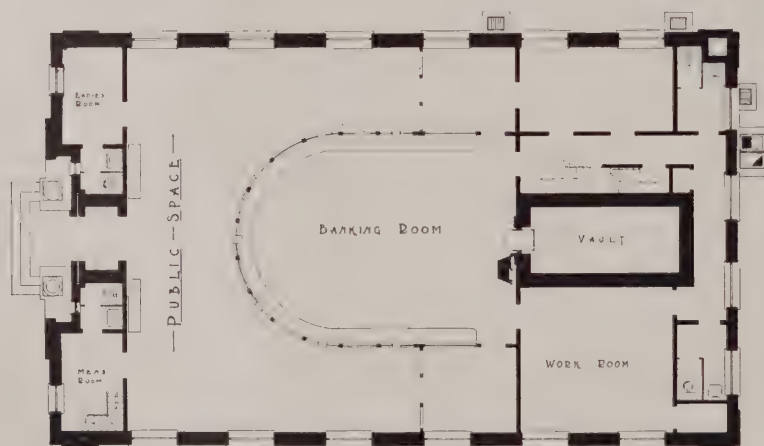
SOUTHOLD SAVINGS BANK, SOUTHOLD, N. Y.
FRANCISCO & JACOBUS, ARCHITECTS

CONSTRUCTION DATA

Type of Construction: Brick and steel.
Exterior Materials: Brick and limestone.
Interior Materials: Travertine.
Windows: Bronze.
Counter Screens: Marble and bronze.
Type of Lighting: Direct.
Heating: Semi-indirect hot water.



MEZZANINE FLOOR



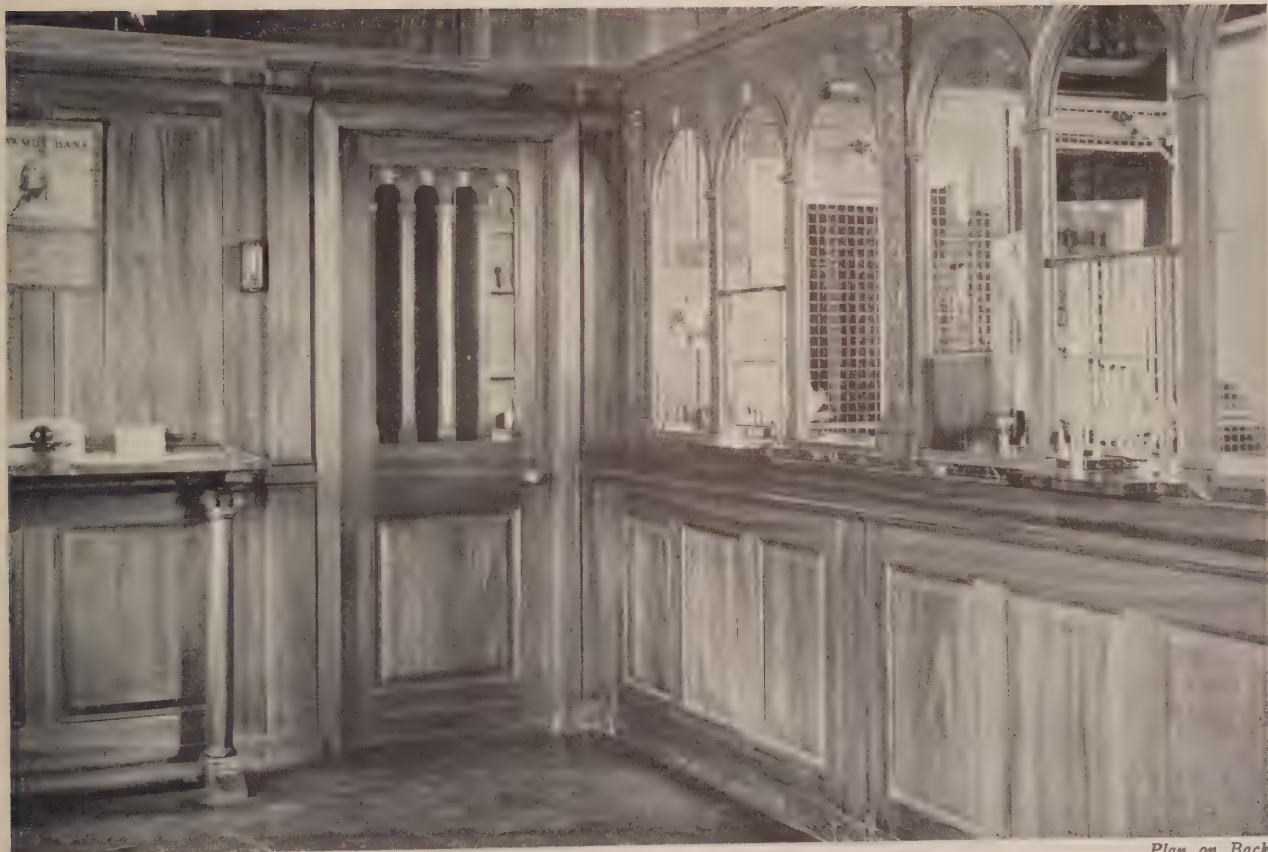
FIRST FLOOR

PLANS, SOUTHDOLD SAVINGS BANK, SOUTHDOLD, N. Y.

FRANCISCO & JACOBUS, ARCHITECTS



GENERAL VIEW



Plan on Back

BANK SCREEN
PROCTOR TRUST CO., PROCTOR, VT.
R. CLIPSTON STURGIS, ARCHITECT

COST AND CONSTRUCTION DATA

Type of Construction: Concrete floor slabs;
wood roof frame; masonry walls.

Exterior Materials: Rock-faced marble.

Interior Materials: Plaster, and wood trim.

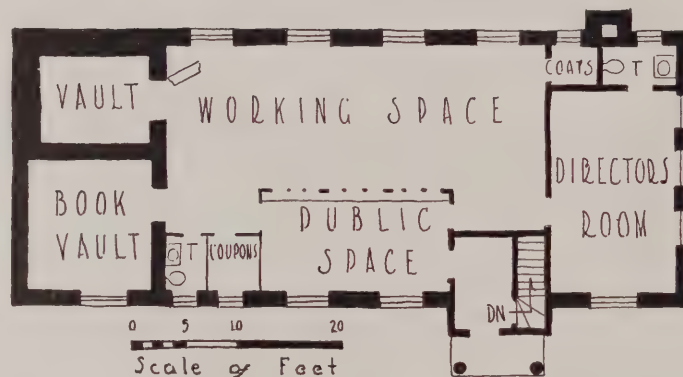
Windows: Wood.

Counter Screens: Wood and glass.

Type of Lighting: Direct.

Date of Contract: January 15, 1923.

Cubic Foot Cost: 64.5 cents.



PLAN, PROCTOR TRUST CO., PROCTOR, VT.

R. CLIPSTON STURGIS, ARCHITECT

THE PHILADELPHIA SAVING FUND SOCIETY BRANCH OFFICES

BY
GEORGE HOWE, ARCHITECT

SOME years ago the Philadelphia Saving Fund Society adopted a policy of opening branch banks in various sections of the city, primarily to accommodate its depositors who, in the modern development of the city, had gradually been moving their homes farther away from its center, and secondly and incidentally to meet the competition of other institutions which were and are prosecuting a vigorous campaign for savings bank depositors. The first building erected under this policy was the South Office, at Broad and McKean Streets. At the same time another branch of exactly the same type was erected at 11th Street and Lehigh Avenue, in the northern section of the city. Two years later followed the building of the branch office in West Philadelphia, at 52nd and Ludlow Streets, which took the place of a temporary office which had been established in an old building at the same location some years before. At the same time another new office of similar type was established at Broad and Ruscomb Streets, some distance farther north than the Lehigh Avenue Office. A year later there followed the building of a Central City Office on 12th Street just below Market Street. This last is a temporary building, established to give immediate service to test the requirements of a much more important office to be erected at the corner of these two streets upon the expiration of existing leases.

All these offices are branches and are connected by every modern means of electrical communication with the Main Office at 7th and Walnut Streets, where the chief administrative work is done. The plans of these buildings are therefore of the simplest nature, consisting only of working spaces, public spaces, and small rooms for the managers. In the second type of branch office, at 52nd and Ludlow Streets and at Broad and Ruscomb Streets, safe deposit vaults have been added for the convenience of depositors. This feature has proved popular.

Since, then, the plans of these branch banks are so simple, their chief interest lies in their design. In each of the types a different idea underlies the composition. In the first building erected the architect conceived the double function of the savings bank building, first as a magnified strong box, and second as a working space. Following this conception, the lower part of the building was encased in a strong band of rusticated stone, with deep, narrow windows and a door of heavy oak studded with large iron nails. This lower band expresses the idea of the strong box. Above this band was placed a lofty expanse of plain wall pierced by large windows to furnish ample light. These windows suggest the working area. Apart from this expression of the dual function of a savings bank building, the exterior design is planned in accord with accepted tradition.

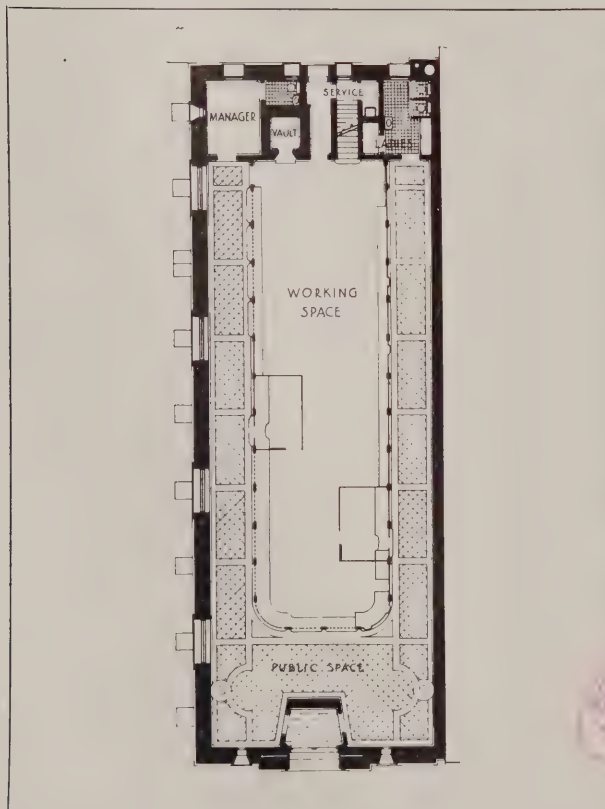
After building the first two branch offices, the architect decided that in conformity with modern commercial practice the old idea of the strong box, as expressed in the building itself, should be given less emphasis, though the general solidity of aspect should be preserved. Freed from emphasis of its fortified base, the building was thought to be more inviting to a timid public. Furthermore, it was decided to employ illumination as a publicity device. The whole building was therefore designed around this double conception,—the large, hospitable entrance door, closed only at the bottom by a richly ornamented grille, and the illuminated inscriptions, which necessitated, or rather suggested, the service balconies and the multiple reflectors of wrought iron which form the chief features of the elevations. This system of illumination has proved very successful in competition with the illuminated letter signs which fill the street of an evening. The great block of stone, flooded in strong white light, dominates the illumination, while at the same time the building preserves its dignity. The walls are again of limestone with a granite base, surmounted by a slag roof behind a parapet. The cornice, having become superfluous with such a system of roof construction, has been eliminated. The interior is again traditional, with a vaulted ceiling and a high banking screen. Wood was abandoned as a material for the screen, however, as it was found to twist and crack, even though constructed with great care, and stone with verde-antique inlay was substituted. The floor is of the same materials. The suspended lights in the form of celestial and terrestrial globes can be seen from the street at night through the large opening in the front of the building and form a very striking ornamental element in the composition, as well as being an excellent advertisement. The admirable ironwork was designed and executed by Samuel Yellin, in coöperation with the architect. On the exterior, as will be seen from the illustrations, two illuminated transparencies have been provided under the wall lamps, one on each side of the main entrance. The frames are movable, and special colored transparencies for displaying educational suggestions and seasonable and other services may be introduced. As this is the only office of the five under discussion which replaced a structure already existing, it is interesting from the architect's point of view to note that a phenomenal increase of business followed the erection of the new building.

The problem presented by the Central City Office at 12th and Market Streets was entirely different. The Philadelphia Saving Fund Society had acquired at this location for the erection of a general office a much larger tract than that covered by the present building, but what functions exactly this office was



Photos. Ph. B. Wallace

GENERAL VIEW



PLAN



BANKING ROOM

SOUTH BRANCH, PHILADELPHIA SAVING FUND SOCIETY
 GEORGE HOWE, ARCHITECT

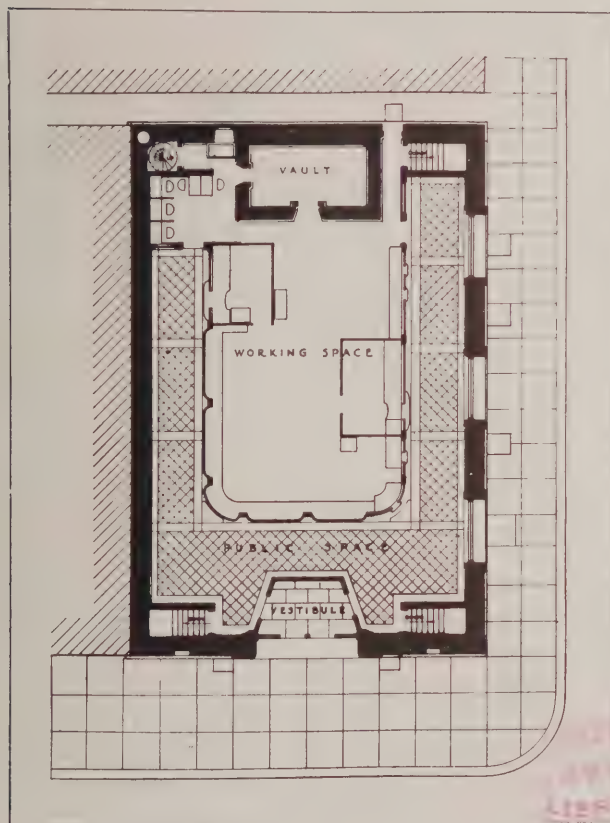


Photos. General Reproduction Co.

NIGHT VIEW



EXTERIOR VIEW



PLAN



Photos. Ph. B. Wallace

BANK SCREEN

WEST BRANCH, PHILADELPHIA SAVING FUND SOCIETY
GEORGE HOWE, ARCHITECT



Photos. Ph. B. Wallace

Central City Office, Philadelphia Saving Fund Society
George Howe, Architect



Entrance Detail

to take over from the already existing downtown office remained to be determined. The problem then consisted in erecting a temporary office on a portion of the property which was immediately available for construction purposes. The operation of this office was to determine the number of depositors, both present and future, it would be reasonable to provide for at the location. The architect therefore approached the problem in an entirely different spirit from that in which he had designed the four permanent offices previously built, as it would have been folly to construct a temporary office otherwise than economically. The use of the most straightforward, modern materials, both for construction and ornament, seemed the only reasonable proceeding. The building therefore assumed the shape of a large shed, spanned by iron trusses exposed on the interior. The walls were built of second-hand brick and all the architectural features were made of rough-cast concrete. The roof was made of tin, and the sash were made of wood as an exceptional enrichment; the main entrance door was made of calamite bronze ornamented with cast bronze studs, and the lanterns and lettering over the door were made of bronze also. Everything was designed in the simplest and most inexpensive way, yet with sufficient generosity of scale to lend dignity to the plain materials. The building was furthermore designed to accord with the old Quaker Meeting



Photos, Ph. B. Wallace

Entrance Lobby



Banking Room

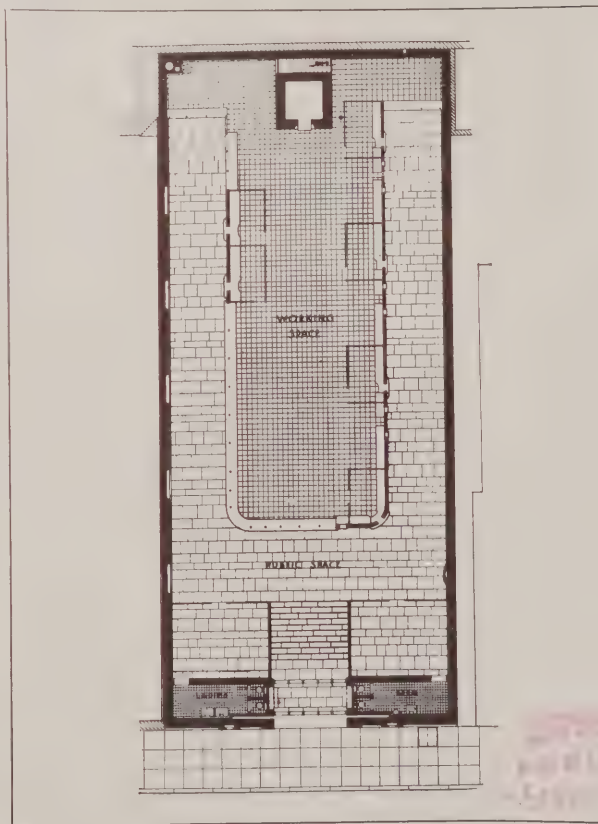
Central City Office, Philadelphia Saving Fund Society

George Howe, Architect

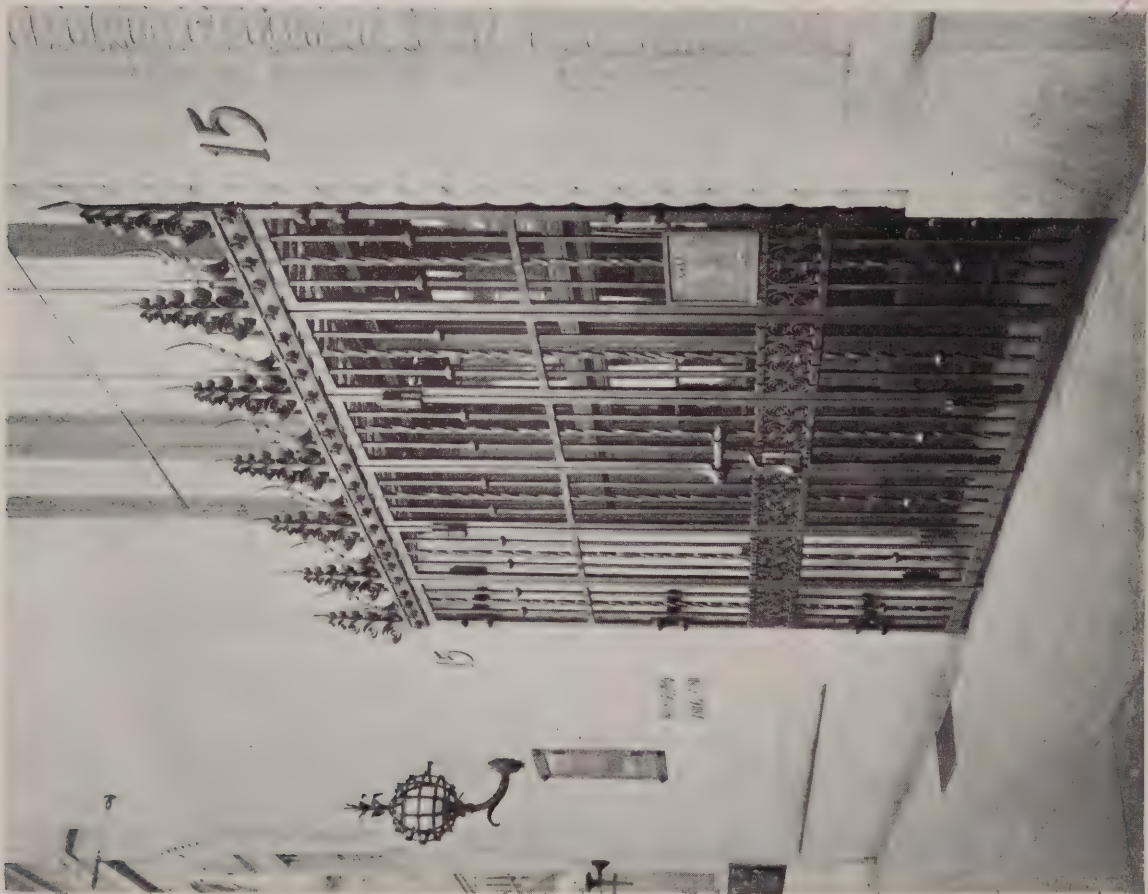
House which stands next to it, as the enclosure wall and gate indicate in one illustration of the exterior. It is also to be noted that had the building been permanent, it would have been unwise to light it from the open space provided by the yard, which belongs to the Meeting House, and may be built upon. As a measure of economy, which was important, and in order that there might be no conflict between the metal furniture inside the counter and the ornamental treatment of the building, it was decided to have the electric fixtures, both the standards on the counter and the brackets on the wall, built by the metal furniture manufacturer, as also the enclosure rails on either side of the entrance. These elements were designed especially for economical sheet metal construction. Furthermore, in order to hold the design together by its color, the floor was paved with green slate, to harmonize with the green metal furniture; the front of the screen was painted a pale green, and the trusses in the roof a darker green.

The success of this experiment in the use of modern mechanical elements and methods in the design of utilitarian and ornamental features, suggested in large measure by the fact that the building was temporary, seems to indicate a field of design rich in possibilities even for permanent buildings.

Editor's Note: These banks were designed by Mr. Howe during the period when he was a member of the firm of Mellor, Meigs & Howe, of Philadelphia.



Plan



RECENT BANKS BY DAVIS, DUNLAP & BARNEY

BY
PARKER MORSE HOOPER

A NEW expression has come into the designing of bank buildings. Not only in New York and Philadelphia is this noticeable but also in the middle west and on the Pacific coast. This new note is largely one of simplicity in treatment and concentration of architectural detail to relieve and contrast with the severity of plain and unbroken wall surfaces. In the east this tendency toward simplification in bank design is particularly noticeable in the work of some of the younger architects. The use of columns, free standing and engaged,

pilasters and heavy entablatures, following academically or freely the several classic orders, entirely disappears in the work of these younger architects. The Greek and Roman temples, the triumphal arch motif and the Italian Renaissance palazzo as architectural precedents for bank designs are fortunately giving way to simple elevations with plain wall surfaces of smooth finished stone and marble, broken up by large and well proportioned openings. The jail- and fortress-like type of bank is fast disappearing, to be replaced by a more consistent and



Photos. Ph. B. Wallace

Plan on Page 888

Tenth National Bank, Philadelphia
Davis, Dunlap & Barney, Architects



Plan on Page 888

National Bank of Commerce, Philadelphia
Davis, Dunlap & Barney, Architects



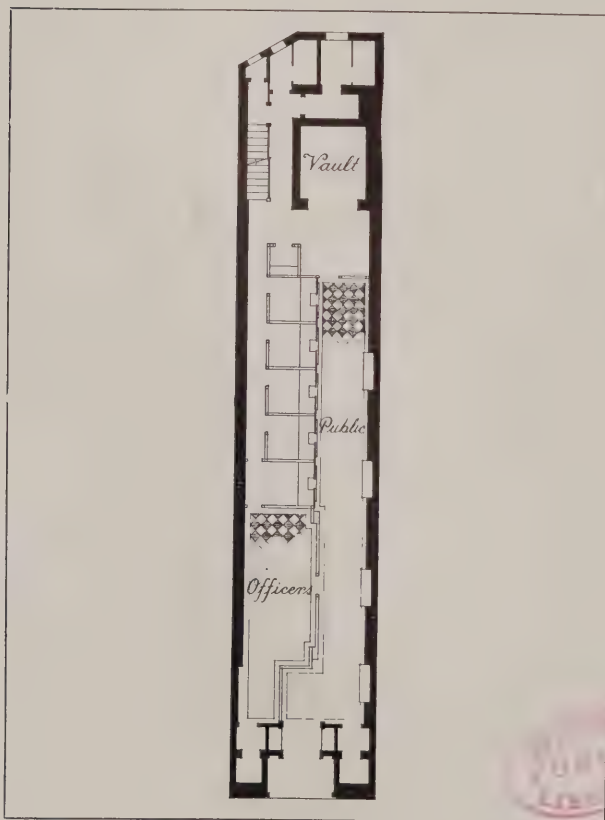
TENTH NATIONAL BANK, PHILADELPHIA
DAVIS, DUNLAP & BARNEY, ARCHITECTS



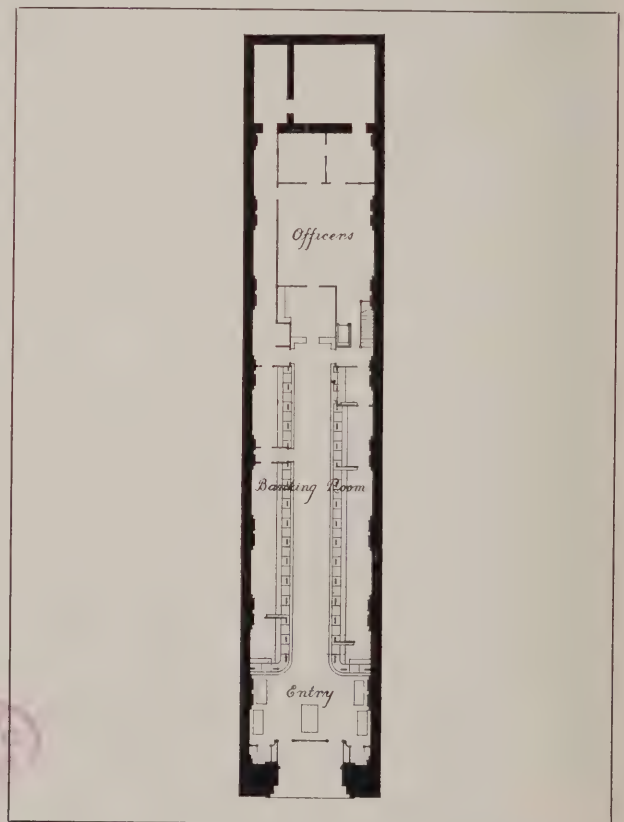
Photo. The Photo-Illustrators

Plan on Page 889

FAIRHILL TRUST CO., PHILADELPHIA
DAVIS, DUNLAP & BARNEY, ARCHITECTS



PLAN, TENTH NATIONAL BANK



PLAN, NATIONAL BANK OF COMMERCE



Photos. William M. Rittase

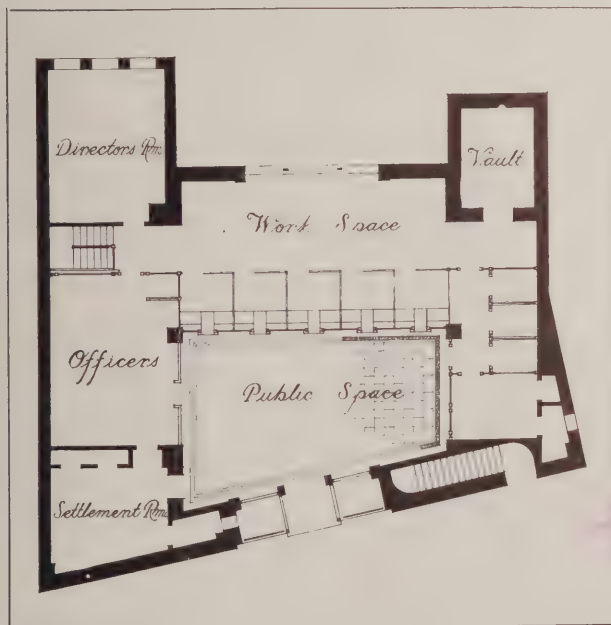
GENERAL VIEW



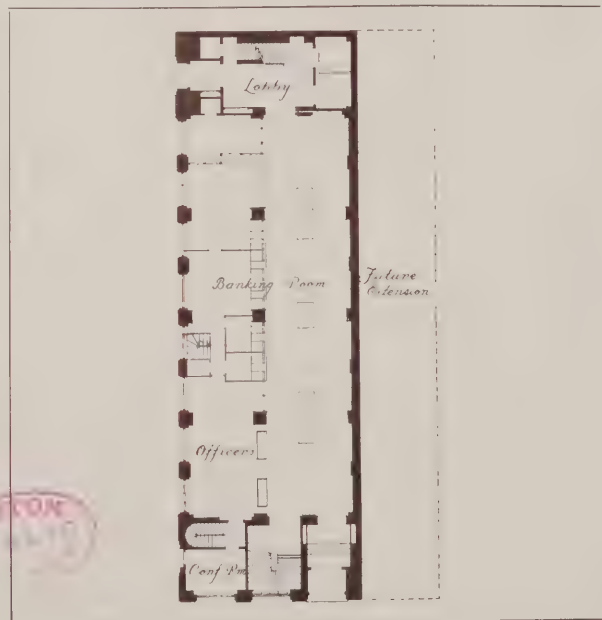
ENTRANCE FACADE

WEST PHILADELPHIA TITLE & TRUST CO.

DAVIS, DUNLAP & BARNEY, ARCHITECTS



PLAN, FAIRHILL TRUST COMPANY



PLAN, WEST PHILADELPHIA TITLE & TRUST CO.



Photo. William M. Rittase

The Fairhill Trust Company, Philadelphia

Davis, Dunlap & Barney, Architects

Plan on Page 889

intelligent design, one more practical and more appropriate for this specialized type of commercialized architecture. The very nature of the banking business demands large, well lighted enclosures.

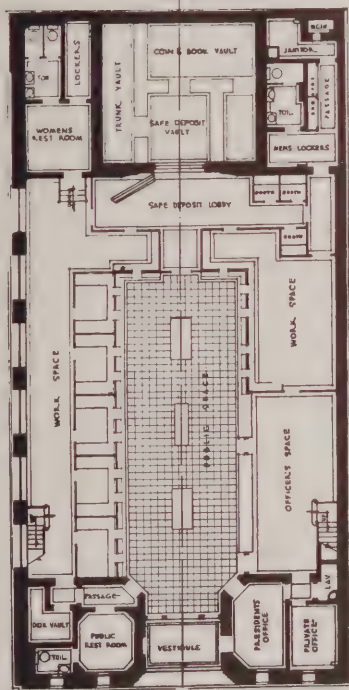
In some of the banks recently designed by Davis, Dunlap & Barney, of Philadelphia, this freshly appreciated consistency in bank architecture is shown in a splendid and satisfactory manner. There is no indication in any of their designs of the influence of so-called "modernistic" architecture. There is, instead, a renewed appreciation and interpretation of Greek and Roman architectural ornament. In the West Philadelphia Title & Trust Company, a six-story bank building on a corner plot, there is found an original use of freely adapted Greek and Roman classic ornament. This ornament is logically placed on the lower portion of the building, where it may be seen and appreciated by the passerby. The four upper stories are severely plain, terminating in a high parapet at the roof line. The Tenth National Bank building occupies a narrow plot at the middle of a block. The chief feature of the design is a high, rectangular opening in perfect scale and proportion with the height and width of the simple facade. Tall slabs of black and white marble are effectively used as the base course of this original design, which possesses unusual individuality and charm. This black marble is effectively used again in the decorative panel placed as a crowning feature of the entrance to the building. Incised decorations, reminiscent of Roman ornament successfully relieve what might otherwise be the severity of the design.

The design of the National Bank of Commerce, although less original, perhaps, than the two banks just described, shows the same appreciation of scale and simplicity. A single arched opening of excellent proportions serves as the entrance to this bank. The doors themselves are sufficiently plain in design to appear as a part of the window treatment of this great opening. No high and massive iron grille or gate shuts the public out. The effect of the entrance as a whole is hospitable and inviting, giving the impression of an open and unobstructed archway. As will be seen from the plan, the depth of this bank is many times its width, so that there is no particular reason or purpose in having a higher or wider opening at the street end. The shape of the lot necessitated that the lighting be obtained from the skylights and not from windows. The Fairhill Trust Company building is even more individual in design. The main banking room is indicated on the exterior by one great rectangular opening flanked by broad piers or pylons, crowned with a high panel bearing the name of the bank. A low cornice of simple moulding caps the whole design. The working space and private offices are also indicated in the exterior design by the low wings, which flank the main part of the building. This unusual treatment is distinctly Roman in effect, as is also the design of the bronze work of the entrance grilles and the detail of the pilaster capitals and architrave above. It is refreshing and encouraging to find such delightful architectural feeling and good taste as are shown in the design of this interesting building.



Photo, Mott Studios

GENERAL VIEW



FIRST FLOOR



MEZZANINE

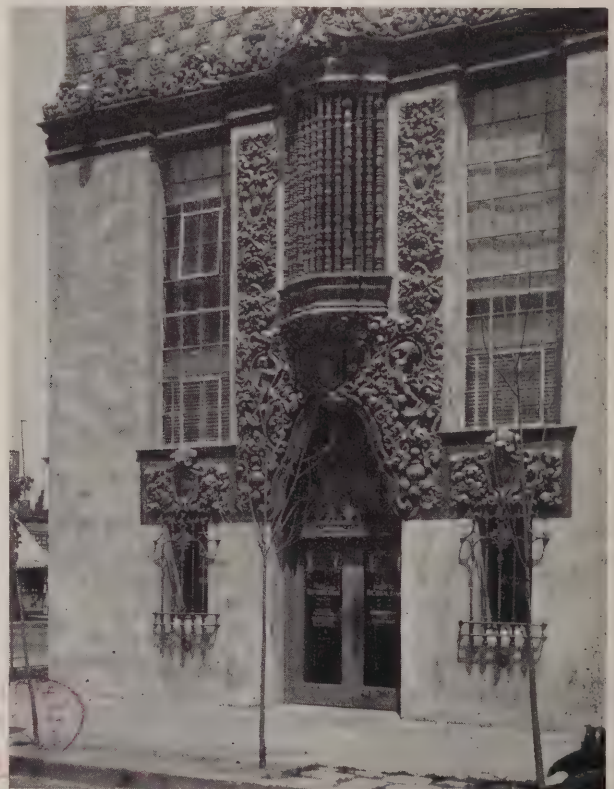
UNION NATIONAL BANK, VENTURA, CAL.
MORGAN, WALLS & CLEMENTS, ARCHITECTS



ENTRANCE DETAIL

SAFE DEPOSIT LOBBY

UNION NATIONAL BANK, VENTURA, CAL.
MORGAN, WALLS & CLEMENTS, ARCHITECTS

*Photos. Mott Studios*

PERSPECTIVE VIEW

FRONT ELEVATION

BRANCH OF PACIFIC NATIONAL BANK, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

THREE BANKS BY WALKER & GILLETTE

THE designing of buildings for banks has long been met by architects with a frankly classical formula. Dignity and a certain quality of impressiveness that is always aided by marble columns have constituted a dual ideal, whether the specific rendering has been Doric, Ionic or Corinthian. The manner or technique has varied far more than the formula or objective, giving us banks of classic architecture, with (more recently) a few in Italian Renaissance, carried out with merit ranging from the finesse of McKim, Mead & White down to the crudities that can result from a total failure to understand the exacting nature of classical design.

Among the foremost designers of bank buildings, Walker & Gillette have long occupied a conspicuous place, and in their new building for the National City Bank at Broadway and Canal Street they have made skillful use of the new mode of architectural expression. On examining the exterior there is, first the unmistakable expression of dignity befitting a bank, and on closer study there is the discovery that a new kind of classicism has been achieved without having recourse to mouldings, to columns, or even to a cornice. Nor is there any expression of the bizarre which such a departure might imply.

If there is any secret underlying the success of this unusual design for a bank building, it will be found in the excellence of all its proportions, in the fenestration and skillful handling of scale throughout. If this be "modernism" in architecture, any but prejudiced critics must see in it the solution of much of the design of our modern commercial buildings, and must see, also, evidence of that

escape from over-used conventions, from outworn architectural forms so long predicted but so many years in coming. There were those, years ago, who looked forward to a day when the too-familiar elements of architectural design might be jettisoned,—but no architect came forward to show how this might be done with more gain than loss. Louis Sullivan did what he could, and, after him, Frank Lloyd Wright, but neither achieved a real substitute, and the Europeans, mostly, were too radical.

It is the excellent sanity of this new bank building by Walker & Gillette that makes it definitely one of the most significant buildings of the year,—sanity and dignity expressed by means essentially novel. It has been awarded Second Prize among buildings of the year by the Downtown League, and is likely to grow in importance as our urban architecture develops toward new expressions. It stands at the turn of an era, and is one of those buildings, forerunners of a wide change, from which later work is dated. Writing in 1940, critics may say: "The prototype of much of our present architectural design, one of the first well defined examples in which a successful departure was made from the classic, is seen in the building done by Walker & Gillette for the National City Bank in 1928."

This building, within, is no less unusual. The conventional treatments of walls or ceiling have been followed. Instead of pilasters, wall intervals are marked by vertical grooves, without base or cap, and with no projection from the wall surface. These perform the same function as pilasters without in any way being pilasters, and illustrate again



Photos. Sigurd Fischer

Plan on Page 894

Branch of National City Bank, New York

Walker & Gillette, Architects



Plan on Page 894

East River Savings Bank, New York

Walker & Gillette, Architects



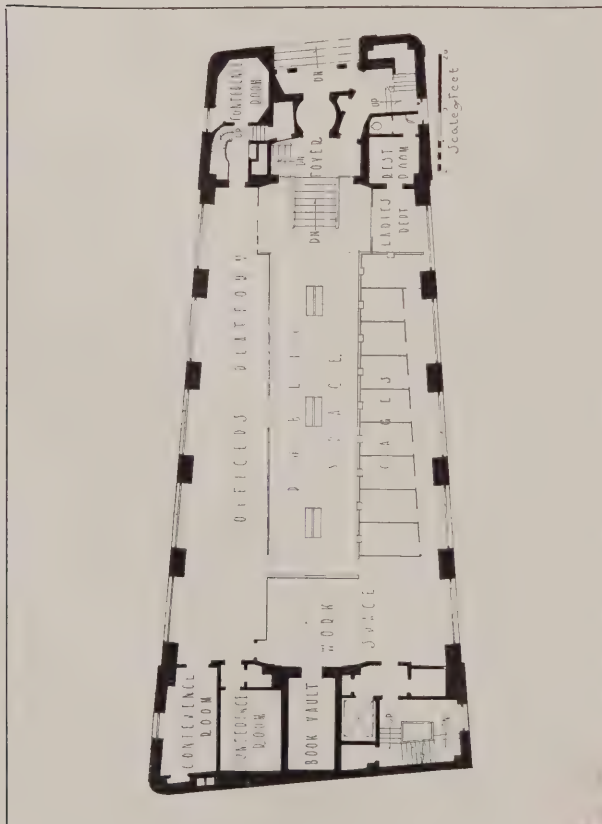
Photos. Sigurd Fischer



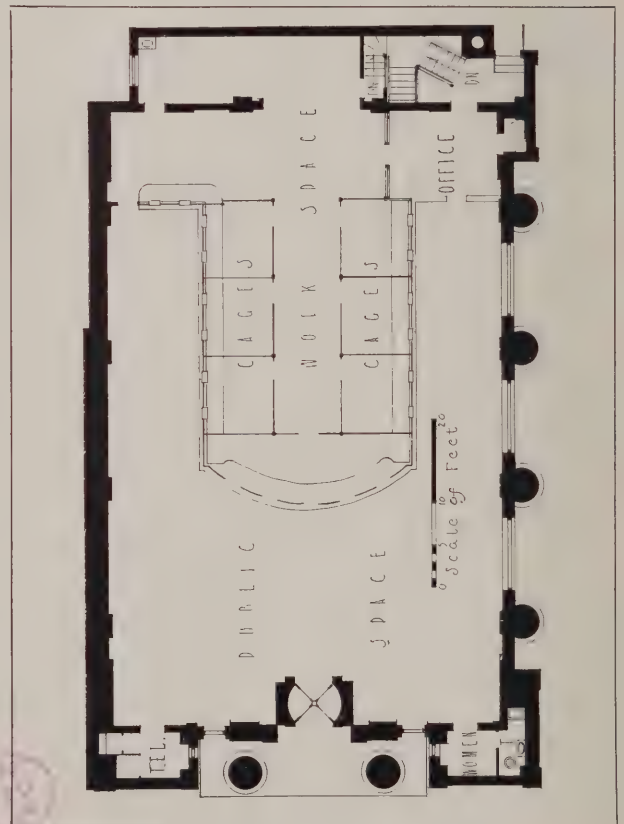
BANKING ROOM

INTERIOR, TOWARD ENTRANCE

EAST RIVER SAVINGS BANK, NEW YORK
WALKER & GILLETTE, ARCHITECTS



PLAN, BRANCH OF NATIONAL CITY BANK

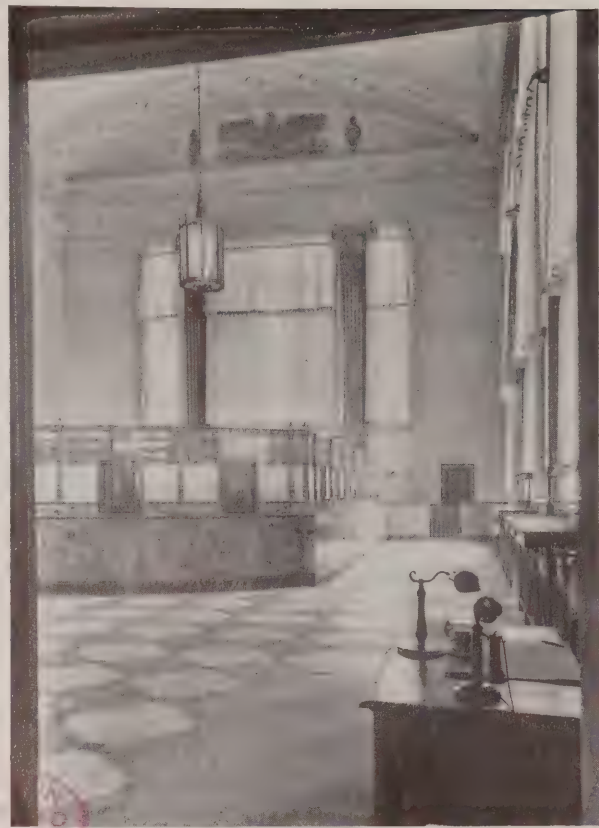


PLAN, EAST RIVER SAVINGS BANK



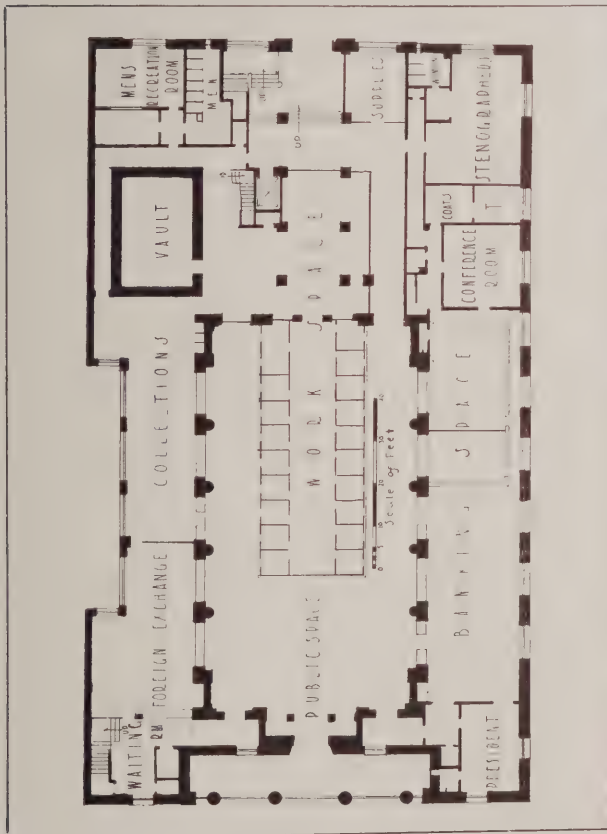
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BRANCH OF NATIONAL CITY BANK
WALKER & GILLETTE, ARCHITECTS

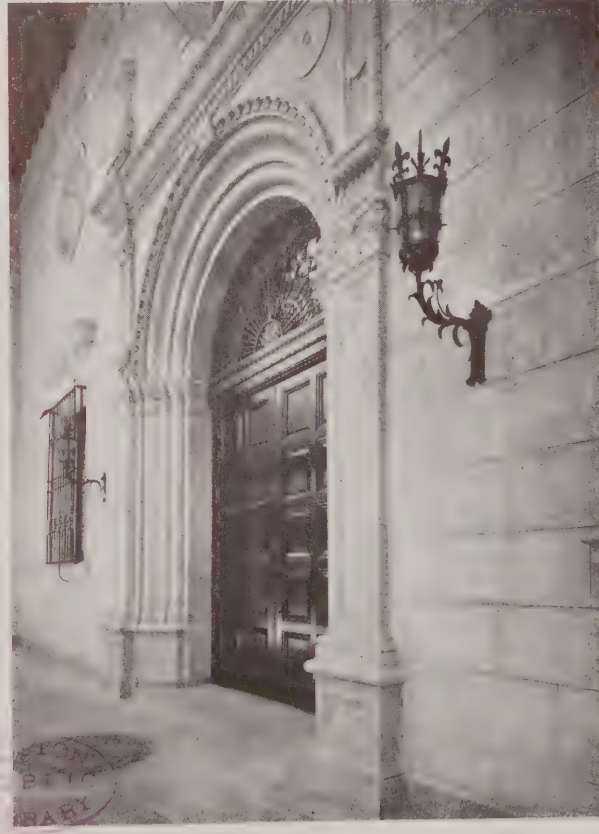


Plan on Page 894

EAST RIVER SAVINGS BANK
WALKER & GILLETTE, ARCHITECTS



PLAN, BRANCH OF NATIONAL CITY BANK,
HAVANA



BRANCH OF NATIONAL CITY BANK, HAVANA
WALKER & GILLETTE, ARCHITECTS



Photos. American Photo Studios

Banking Room



Plan on Page 895

General View

Branch, National City Bank of New York, Havana

a remarkably successful departure from use of conventional forms. The ceiling decoration is in very flat relief, developing a pattern strikingly unlike that of the usual ceiling. The fittings are of silver and gun metal, and the entire effect of the great banking room is as restfully dignified as it is thoroughly unusual. An interesting aspect of this design for the National City Bank is found in the studied adaptability of the type for branch bank buildings in all parts of the world. The architects definitely intended to create a type for a bank building that would accord with the local architecture of varied lands and at the same time be recognized at a glance as of the National City.

Walker & Gillette's treatment of their design for the East River Savings Bank is of another sort, and at first glance seems to be another addition to our already numerous classic versions. It is not, however, of such obvious derivation, but is carefully designed in the manner of the Classic Revival of 1840 or thereabout. That period made the most of all the conventional classic forms,—columns, pilasters, Greek frets and anthemions. It was more classic than the architecture of Greece itself. It is curious that the manner of the Classic Revival has not been seen more often in current adaptations, especially in buildings of this sort. It lends itself well to the expression of dignity,—many stately residences of the period looking, indeed, more like banks than dwellings. Its adaptability in scale also commends it, for it can be made to assume bold or monumental proportions for the exterior and any degree of reduction for the interior.

In the East River Savings Bank the architects have shown due appreciation of this adaptability, and have achieved an interior excellently in accord with the best traditions of the old New York architecture of the Classic Revival. A conspicuous detail is the design of the tall pilasters of verde antique marble, and it is interesting to compare these with the non-stylistic grooves in the interior of the National City Bank. It may well be that the modern trend in design is coming to put all historic precedent in the discard; it will be interesting to watch its course.

Meanwhile, for those who still look to historic derivations, this East River Savings Bank cannot but afford a valuable suggestion for the revival of the proud old style of the Early Republic.

Before the development of this international, non-stylistic kind of design for National City banks throughout the world, a bank building for Havana was planned by Walker & Gillette. The manner they chose was a version of Spanish Renaissance, rather bold in scale, the building being a large rectangular mass with the entrance in a loggia treatment of four Renaissance Corinthian columns. This entrance is the feature of the exterior, and was appropriately designed with a screen of wrought iron in the Spanish manner. Iron grilles protect the lower windows, and the roofing of Spanish tile gives further "local color." One interesting observation on the choice of style is the notation that when local architects, especially in Latin America, design an important building they generally turn to the French type of the Beaux Arts of the 1890's. In other words, they depart from their own logical local precedents, whereas when architects from, for example, the United States, are commissioned to build an important building in any foreign country, their first thought is to design in a manner locally appropriate. The interior of the National City Bank in Havana consists of one large banking room, with high clerestory windows and an interesting ceiling. The various private offices are disposed in a mezzanine and on the main floor, clear of the banking space, in a way not to detract at all from its sense of spaciousness. The architects have combined a practical and effective plan with a well mannered architectural treatment.

The New York architect is frequently called upon to design banking premises which are to occupy some portion of the street level floor of a large general office building. Denied the opportunity to achieve a large effect, our architects wisely, and for the most part ably, direct their efforts towards nicety of detail. They design a good looking entrance, with as much window treatment as the bank frontage allows, and concentrate as much effect as possible in the interior.

F.A.
1928

THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING
&
BUSINESS

PART TWO

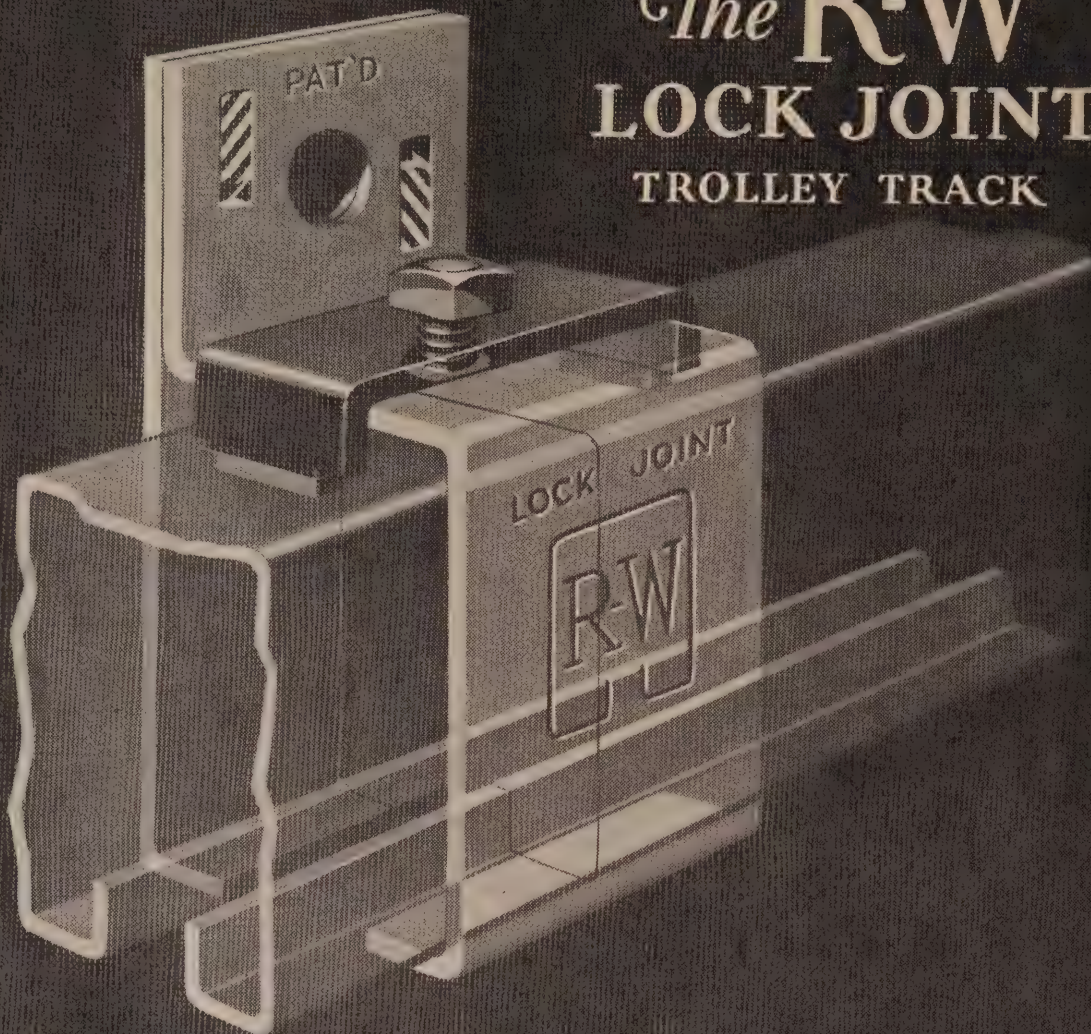
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Published Monthly by

ROGERS & MANSON COMPANY

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BOOK DEPARTMENT

REAL ESTATE TITLES AND CONVEYANCING

Reviewed by TYLER STEWART ROGERS

THE ownership of land and its sale or transfer are matters of fundamental interest to those engaged in any branch of the building industry, whether professionally as architects or as contractors or owners. The legal aspects of land ownership, titles, and conveyancing have become exceedingly complex through their gradual development from earliest times and through a lack of uniformity in state laws relating to the subject in this country. The authors of "Real Estate Titles and Conveyancing" have seen the need for a comprehensive treatise on the legal and practical aspects of land ownership and the transfer of ownership and have prepared a valuable reference book which combines the characteristics of a desk manual for the practicing lawyer; of a text book for students of law and real estate; of a help for those who are about to enter the exacting profession of title examiner, and of a comprehensive analysis of real property ownership for those who invest their funds in the ownership, leasing or mortgaging of land and real property. It is rare that a single volume serves so many purposes. Nevertheless, it may be said that this volume is of interest and value to all whose business brings them in contact with real estate in any of its many phases.

The work is divided into 20 chapters and 22 appendices in which correct legal forms used in real estate transactions are presented. In the first chapter the authors have discussed the "Development of Real Property Ownership." The two elemental systems of ownership,—the allodial and the feudal systems,—are briefly described as to their origin and their influence on subsequent legal practices. Attention is particularly devoted to the early forms of land holding in the United States and the original sources of title which form the basis for all land holding in this country. Chapter II is devoted to "Land and Its Constituents," and the third chapter discusses "Rights and Interest in Land." These two chapters constitute a condensed and valuable analysis of the legal background of property rights, beginning with a definition of property, an explanation of what can be owned, the constituents of land, including mineral rights, surface and sub-surface water, riparian rights, vegetable products, and fixtures. These matters directly affect owners' rights in property, and every land owner would profit by a clear knowledge of these legal distinctions. The third chapter takes up rights in realty, fees or estates of inheritance, extent of fee ownership, life estates, dower, courtesy and homestead. Here also are discussed the problems surrounding easements, rights of way, party walls and support of adjacent property; rights in light and air, future estates, tenancy and related problems. In these 46 pages is condensed an exceptionally clear exposition of the legal phases of real estate ownership, and if the book went no further it would be valuable to the layman for this material alone; valuable also to the real estate broker, and to the architect who desires to be familiar with the problems which must be encountered by

his clients when purchasing land and erecting buildings.

The fundamental purpose of the volume is obviously to serve as a treatise for lawyers and title examiners. Beginning with Chapter IV on "Descriptions," which is devoted to the important matter of correctly defining the limits of property and identifying its location beyond all possibility of doubt, the authors have devoted five chapters to the preparation of legal documents associated with the transfer of real property. Chapter V covers "Land Surveys" and is in itself a condensed text book for civil engineers and surveyors. Chapter VI discusses the transfer of title and description, the development of the indenture form, and the manner in which title may change hands,—voluntarily, by descent or will, and involuntarily through legal action by others as in the case where ownership changes when a lien is enforced. Chapter VII is devoted to "Recording Acts" and explains the need for statutes requiring the recording of property and ownership. Chapter VIII is devoted to "Recording Offices" and contains a detailed list of the places where records which affect the title in real property are kept. The next section of the book is concerned with the practical problems of "Abstracting and Examination of Title" (Chapter IX); "Illustration of Examination of Title" (Chapter X); and "Report of Title" (Chapter XI). In this section there are given detailed instructions with illustrations of the actual forms used for a complete title search, examination and preparation of a title abstract and report. Chapter XII discusses the various forms of "Real Estate Title Actions" including foreclosure, partition, ejectment, action to quiet title, and sale or mortgage of trust property.

The practical nature of the remaining chapters is indicated by their titles. Chapter XIII relates to the business of "The Abstracter and Title Examiner," the nature of his organization, his plant and equipment, and his importance in the community. Chapter XIV discusses "Title Insurance"; and Chapter XV the "Preparation and Closing of Title." Chapter XVI is devoted to "Escrows"; Chapter XVII to "Real Estate Contract Law Suits"; and the three remaining chapters give illustrations of sale, exchange and mortgage loans.

The authors of this work,—Nelson L. North, Member of the New York Bar and Lecturer on Real Estate, New York University; and DeWitt Van Buren, also Member of the Bar, and Manager, Maintenance of Plant and Records, Title Guarantee and Trust Company, Brooklyn, are thoroughly equipped by experience, training, and a capacity to present their facts clearly and concisely, for the difficult task which they have successfully completed. The book was purposely constructed and arranged so as to quickly familiarize lawyers and realtors with the work of examining titles as conducted by abstract companies.

REAL ESTATE TITLES AND CONVEYANCING. By Nelson L. North and De Witt Van Buren. 719 pp., 6 x 9 ins. Price \$6. Prentice-Hall, Inc., 70 Fifth Avenue, New York.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

PUBLIC SCHOOL PLUMBING EQUIPMENT

Reviewed by C. W. SPENCER

IN designing schools, there is no detail which should receive more careful study and planning than the plumbing and sanitary layout. The importance of this can be readily understood when it is realized that defects in the sanitary plant of a school may cause serious injuries to the health of the students. These defects may be in the type of material used or in the way it is installed. Thus floors, walls and partitions made of material which is absorbent are very likely to give rise to unsanitary conditions which may have a lasting effect on the health of pupils. The fixtures themselves sometimes embody imperfections in design and material, as for instance porcelain, which is likely to craze or crack, after which it becomes absorbent. A round toilet bowl is not suitable for school purposes, since it permits liquids to spill over. In addition to this, the workmanship of installations is very important, involving a study of proper heights and spacing. It is considerations such as these which should govern the selection of an ideal set of school plumbing fixtures. Although many manufacturers offer plumbing fixtures which are said to be suitable for school purposes, none of them have a line of fixtures specially designed to be used in schools. This is probably due to the fact that school administrators and planners have not made the need for such a line sufficiently apparent, as no doubt manufacturers of plumbing equipment, among whom there is keen com-

petition, would be more than willing to supply such a line if they knew exactly what the requirements were and that the demand would be sufficient to warrant the expense. Since there is no such ready-made system of school plumbing, it is necessary for those in charge of planning schools to make a careful study of the requirements in each particular case and to make them fit as nearly as possible the qualifications of the fixtures designed for hospitals, apartment houses, jails, factories, homes, or other types of buildings.

Probably the best way of approaching such a problem is to set up a group of standards by which all the fixtures to be chosen may be judged. These standards are the composites of various criteria or factors upon which the standards are based. Although it is primarily the duty of school administrators to set up standards and requirements of the units and materials to be used in school building, such administrators very frequently have not made a sufficient study of the problem and leave much to the discretion of the architects in charge of designing buildings. It is, therefore, very important that the architect know something of the numerous criteria going to make up the standards of a modern school sanitary system. Up to the present time, there probably has been no complete treatise on this subject, although a great deal has been done by educational engineering in developing the standards for other details of school

REAL ESTATE MERCHANDISING

By *Albert G. Hinman and Herbert B. Dorau*
Assistant Professors of Economics, Northwestern University School
of Commerce; Research Associates, Institute for Research in Land
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American Architecture

By

Fiske Kimball

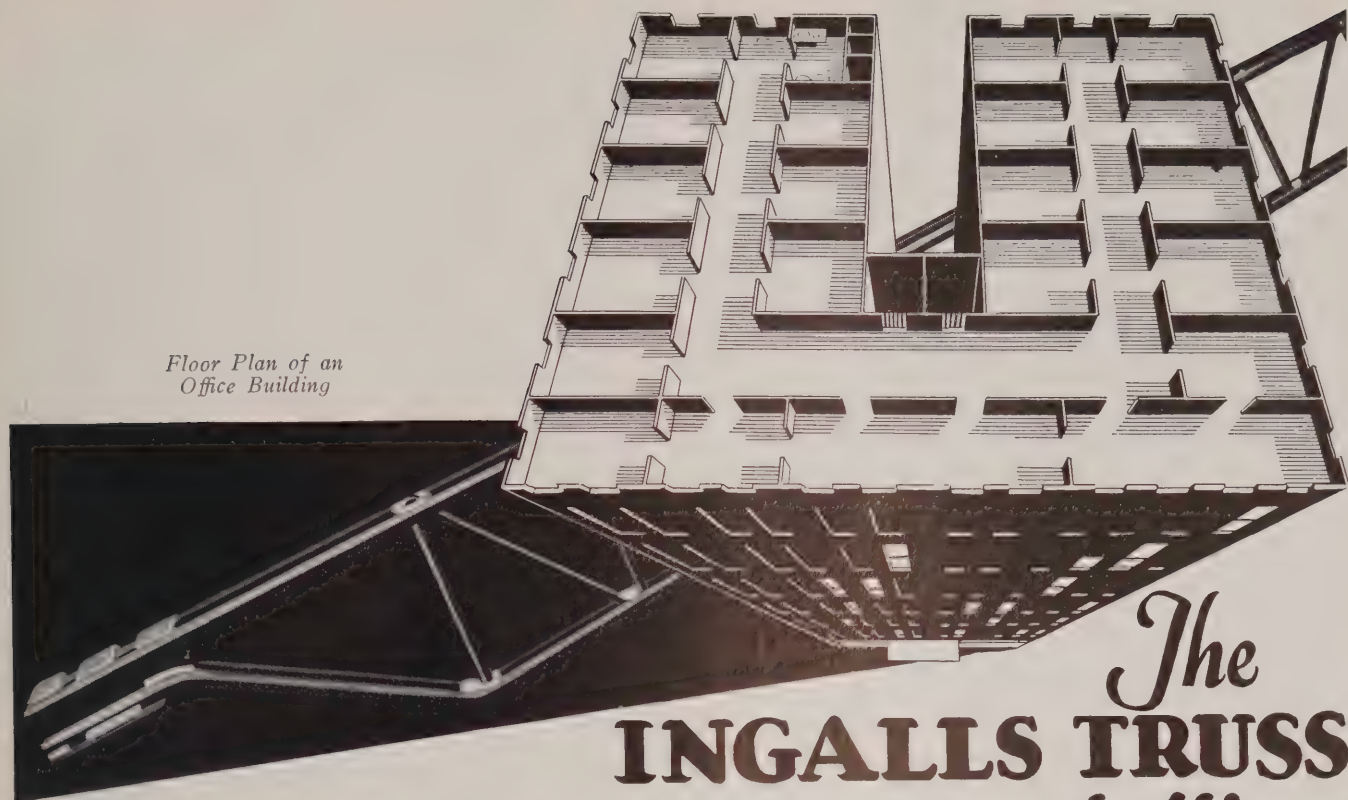
WRITTEN for the layman as well as for the architect, Mr. Kimball presents a survey of American architecture from its first beginnings in the seventeenth century to its latest achievements in the twentieth. Mention of no important detail is omitted, and the carefully prepared text is accompanied by well selected illustrations in half-tone.

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work, such as the sizes of classrooms. Such information as is available from direct experience and experimentation had not been gathered in a complete work until very recently, and the standards of school plumbing, as such, have not kept pace with the rapid development of plumbing equipment designed for other buildings.

The subject, however, is well handled in a recent work by Minor Wine Thomas, called "Public School Plumbing Equipment." This book represents much investigation and study of possible elements entering into the selection of equipment for the sanitation of school buildings. Existing plants have been studied very carefully, and the coöperation of plumbing manufacturers throughout the country has been enlisted in the search for information on this subject. Not only has a careful study of existing layouts of schools been made but also study of hotels, public buildings, office buildings and public comfort stations. In addition to this, an exhaustive study of published material in the fields of school buildings, architectural equipment, sanitation, hygienic plumbing, school surveys, sanitary surveys, plumbing manufacturers' catalogs, sanitary codes and plumbing trade journals has been made. The subjects are developed along the line previously suggested here, and the second chapter contains a very clear, concise description of the criteria involved in the school plumbing as well as a list of criteria and a short explanation of each. The next chapter deals with the standards based on the criteria and experimental evidence. In this chapter such experimental investigations as have been made are presented as evidence in support of the standards set up. The fol-

lowing chapter is devoted to standards based on criteria and experiment but not supported by experimental evidence. In this field there is need for much further work, but such facts as are available are here presented in a very convincing manner. A checking list is given presenting a summary of criteria to be considered in standardizing plumbing equipment. Each item in this chapter represents a criterion which is discussed in the former chapters but is here reduced to a word or phrase. A summary of recommendations is also given containing a partial list of recorded standards which involve the best information yet worked out in conformity with the criteria of the checking list. Only those standards are suggested for which there is some evidence in their support drawn from experimentation or from experience. These recommendations should be very useful to the architect in making a careful study of the sanitary equipment of any school building or buildings, and they should also lead to the development of a line of plumbing equipment much more fitted to the needs of the school building than any that has been developed. The remainder of the book is occupied by a selected list of books and articles.

This book is not intended as a complete treatment of the subject of plumbing in its entirety and does not attempt to deal with pipe layouts or drainage systems but confines itself to study of the fixtures and their surroundings. The fixtures discussed include showers and swimming pools, which should be of especial interest.

PUBLIC SCHOOL PLUMBING EQUIPMENT. By Minor Wine Thomas. 128 pp., 6 x 9 ins. Price \$1.50. Bureau of Publication College, Columbia University, New York.

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Company, 212 Summer Street, Boston.

IN a limited edition folio monograph, in portfolio form, this work is devoted to recent ecclesiastical buildings designed by a French Benedictine monk. The volume contains 29 pages of appreciative and critical text, a full index of illustrations, and 116 plates, eight of which are in color, while 16 show plans, elevations, sections and details. The subjects considered are seven in number,—Quarr Abbey, in the Isle of Wight and, in Holland, St. Paul's Abbey, Oosterhout; the parish church, rectory and school in Noordhoek; the sisters' convent and kindergarten at Bavel; the college and chapel of the Augustinian Fathers, at Eindhoven; an enlargement of the parish church, at Heerle; and the cemetery chapel at Bloemendaal. Each one of the seven subjects is given exceptionally full photographic representation, so that no questions that may arise in the reader's mind are left unanswered. To those who are especially interested in examining the most recent phases of ultra-modern architectural development, the adequacy of the illustrative material for each building will prove a welcome contrast to the usual fragmentary and insufficient mode of recording contemporary work.

Dom Paul Bellot, to the exposition of whose achievements the volume is solely confined, was born in Paris in 1876. Obtaining his diploma from the Ecole des Beaux Arts at the age of 18, he entered the Order of St. Benedict at the Abbey of Solesmes. When the religious orders were expelled from France, the congregation to which Dom Bellot was attached removed to the Isle of Wight, where Quarr Abbey was ultimately built to receive them. In 1906, at the direction of his abbot, Dom Bellot went to Oosterhout in Holland to begin a monastery for monks who had taken refuge there after their expulsion from France. Nine months later, returning to the Isle of Wight, he devoted himself to the first permanent building at Quarr Abbey. At intervals thereafter he labored upon the completion of the abbey and at the different projects undertaken by him in Holland, all of which are here shown *in extenso*, and give a complete record of his work from the beginning of his practice.

Quite apart from any interest the buildings may possess in themselves, the circumstances of their origin exhibit a curious reversion to the mediæval method of procedure. In the middle ages the monastic bodies were the conservators of the art of building, as they also were of the other arts. When a church, an abbey or a castle was to be built, application was made to the abbot of one of the great monasteries who, thereupon, supplied the architect in the person of one of the monks skilled in design. The monk entrusted with this commission visited the site, prepared the drawings and supervised the construction of the edifice. There is sufficient documentary evidence to show that this was a recognized practice of the period, call the monkish designer architect, master mason, master craftsman or whatever you please. This usage accounts for numerous phenomena in the development and spread of architectural modes that it was customary, until comparatively recently, to attribute to mere coincidence. In Dom Bellot's case we see the old practice revived in all its essential points.

All the examples of Dom Bellot's work here presented are of brick construction and, one and all, they are expositions of the purely modern trend of architectural design, modified to some extent, however, by a more or less active consciousness of tradition. They are not so conspicuously radical in character as a great many of the recent Dutch and Scandinavian structures, nor so daring in conception. Neither have they, for the most part, the grace of form disclosed by several of the great brick structures that have distinguished the designing of public buildings in Sweden. So far as the composition of mass goes, the most convincing in external character are the abbey church at Quarr, and the octagonal cemetery chapel at Bloemendaal, in Holland. The other works are by no means lacking in vigor, but their exteriors offer none of the imaginative boldness that now and again enlivens the creations of Dutch, Danish or Scandinavian men of the newer school, nor do they afford the engaging stimulus of adroit or naive solutions of minor features occasionally to be found in both the public and domestic designs of the ultra-modern camp. In the exterior of the Oosterhout group, one is reminded of some of the barrack-like institutional brick architecture that marked the late Victorian Gothic episode in both America and England, and the question involuntarily arises, "What actual advance or betterment has occurred since then?"

Taken all in all, Dom Bellot's management of interiors is far more convincing than his achievements in the realm of external composition. The refectory in the conventual buildings at Oosterhout manifests an all-embracing quality that may equally well win the approval of either the pronounced modernist or the staunch adherent of tradition. The interior of the abbey church at Quarr, too, has much the same stable value that would elicit commendation from either school. On the other hand, the roofing system of the monastic church at Oosterhout, where the structural scheme and the fenestration are ingeniously interwoven, is both original and highly interesting, and likewise one of the most significant contributions Dom Bellot has made to current architecture. At the same time, it will be found worth while to scrutinize Dom Bellot's use of elliptical arches and low-haunched pointed arches, the latter not always pleasant in their application, although striking. In the matter of fenestration and the admission of light, in the English and Dutch work alike, distinctly interesting things have been done, although in a number of instances the angular brick tracery, while logical enough in the employment of material, is not comfortable to look at. Striking results are also gained by the use of vari-colored brick and divers-colored mortar joints.

Dom Bellot might be characterized not inappropriately as a "conservative modernist." His work is universally dignified and serious, and he never resorts to spectacular feats. While his buildings often lack suavity of execution, they are always honest in their obvious construction and fidelity to the structural aptitude of the materials used. Furthermore, whether his structures please or repel, they invariably possess a distinctive quality and afford food for thought. Careful examination of the plates in this volume cannot fail to repay anyone who is seriously concerned with the possibilities of interpretation in brick, a subject of importance to architects.



"FINANCE AND CONSTRUCTION"

FROM A LITHO-PENCIL SKETCH BY M. GOGOIS

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME XLVIII

NUMBER SIX

JUNE 1928



BANKING SCREENS

BY

CHARLES A. HOLMES
OF HOLMES & WINSLOW, ARCHITECTS

THERE has been, in the past two or three years, a decided trend in favor of discarding the high banking screen for a type of low banking counter, as depicted in illustration "F", and insofar as we are concerned, it has been the bankers themselves who have seen or heard of this type of counter who have insisted that it be used, or at least strongly considered. It was our first thought that, from an architectural point of view, the high screen was a necessity, but since we have carried out recently quite a number of banking rooms with the low type screen, I must confess that in my judgment, it does not in any wise affect the architecture of the room adversely, but does open up the quarters, securing a better appreciation of the merits of the room itself. We have shown in illustration "F" a counter that has been built several times by ourselves, and it is highly thought of by the bankers using it.

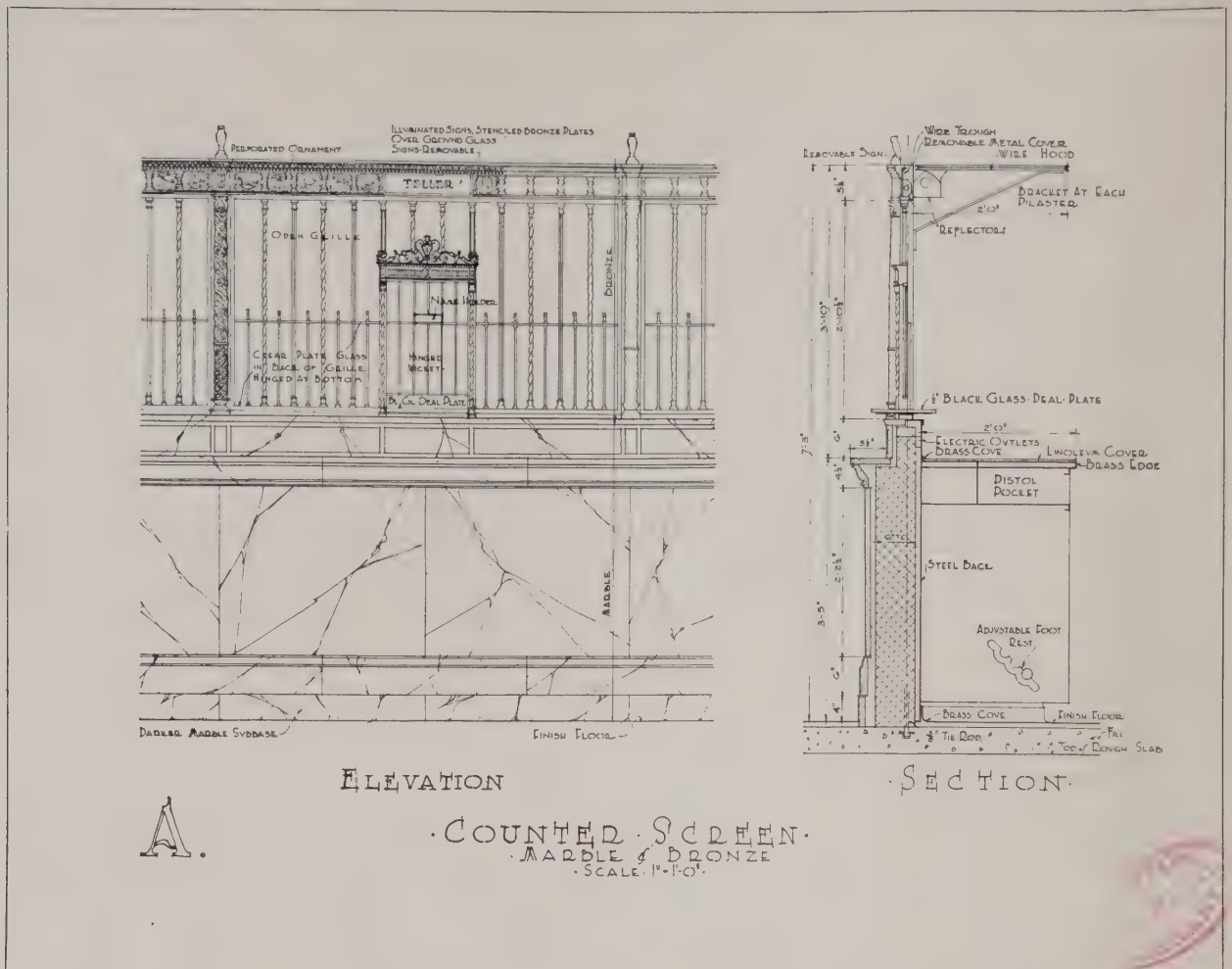
The normal height of the ledge and working counter is 41 inches, and we have arranged the upper ledge (that is, the ledge over which the money or pass book is handed) 10 inches higher, although in some cases this is only 7 or 8 inches over the counter. We keep it the 10 inches so that the tellers may have a practical space between the working counter and the upper ledge for storage of change machines or for the protection of stacked bills, etc. We believe, however, that should this low type be used, there should be at least one low wicket, that is a wicket the bottom of which is not over 41 inches from the floor as we have shown. This will be found a necessity for the use of small children who have recourse to a bank without their elders. The backing of the low counter should follow the high type of screen in regard to arrangement of cash drawers, cupboards, etc. The lighting of the low counter is effected by a continuous reflector just under the upper ledge, but set back in the corner as shown in the section of illustration "F."

Most banks insist on cages for the individual departments, and we have provided a low cage of metal (although it may be of wood or wire) with the solid portion extending up to the top of the marble ledge with glass (preferably clear plate glass)

from the ledge to the top line of the bronzework. This will give the teller, we believe, sufficient security. Of course, a locked gate is provided at the rear of the cage. Building and loan associations, however, do not usually require cages for their tellers, and the low type of counter is especially adaptable to them. I am honestly of the belief that we are only seeing the beginning of this practice in this country, and that the more bankers become familiar with it the more general its use will become. Practically all bankers are talking about it, particularly if they are about to build new quarters. The idea of low counters for banking originated in Europe, and is much in vogue there. It has been suggested that with the low type of counter, the bank is more exposed to the danger of daylight hold-ups, but we believe this will work out in practice in just the opposite way, for if a hold-up were attempted it would be observed by every employe of the bank, and some employe not in the line of danger would be able to either fire a shot at the marauder or at least release the burglar alarm, the latter being what the robber most fears, almost without exception.

The one important attribute of this type of screen or counter, and the one large factor in favor of its ready adoption by bankers, is the personal banking idea it makes possible,—the close contact between depositor and teller,—and the further carrying out, behind the screen, of what at present exists between the officers and the depositor,—that close, personal banking idea without which any bank must expect to eventually fail, and which most banks encourage.

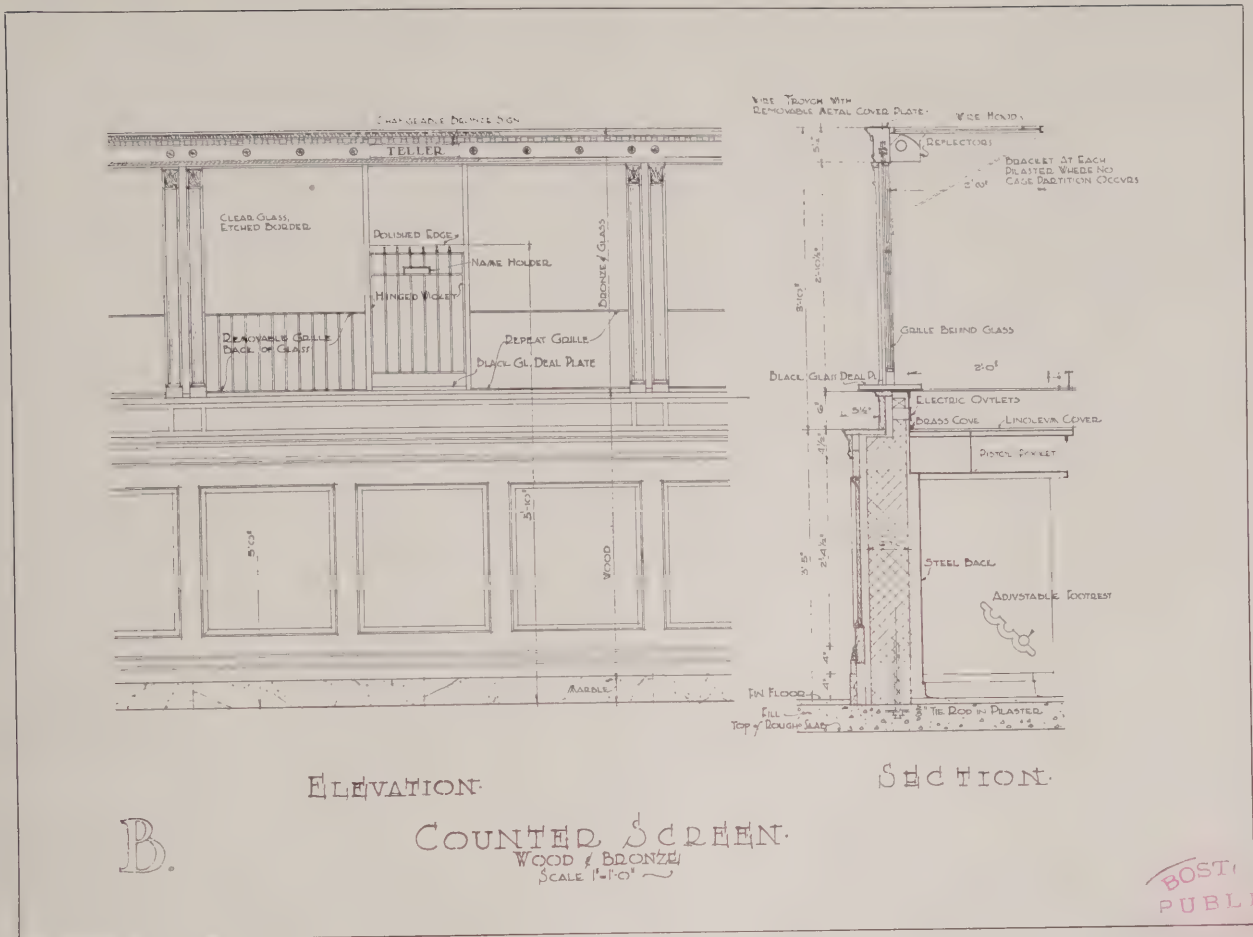
We show in the cuts accompanying this article, five types of high screens of sufficient diversity, and I believe that the individual designer may vary any type to conform to his own ideas. These screens are all practical and have been constructed, with variations, many times by our firm in various bank buildings. The first scheme, lettered "A," is the most likely to be required in a high class banking room, owing to the selection of fine materials,—marble for the lower part, or "die," as it is called, and bronze for the upper portion. The tile backing is the first portion erected, and while this is going



up it is built around $\frac{5}{8}$ -inch rods, the rods extending clear to the top, one rod to a column or pilaster. Then the marble facing is applied, and we think it well to have a darker marble for the sub-base. The bronzework follows the marble, and after the pilasters and cornice have been set in place there is a nut with washer applied to the top of each $\frac{5}{8}$ -inch rod, and the tightening of this nut stiffens and holds the screen in place. The screen if over 10 feet in length will, however, need greater stiffening, and that is accomplished by the cage partitions; if no cages are contemplated, a $\frac{3}{4}$ -inch rod from the top of the screen to the back wall may be necessary on approximately 10-foot centers. The counterwork at the back will not hold the bronze in place if no cages are installed. We have, in some screens where no cages have been installed, substituted a light T-iron for the rod and then stiffened the whole screen by a diagonal strut at the floor, being careful that the strut did not extend more than 16 or 18 inches out from the T-iron. This screen could have either high or low wickets at the option of the banker. Some sections of the country prefer what is known as the low wicket, that is with the deal plate level with the ledge and the counter back of it, while other sections prefer the high wicket as illustrated in this detail. The width of a wicket should be about 14

inches, and it is very important that the top of the wicket should not be too low. We usually make it not less than 5 feet, 6 inches from the finished floor, so that a person of average height will not have to stoop to talk with the teller. The "New Accounts" wicket in a savings bank should be anywhere from 2 feet to 4 or 5 feet wide, and we have installed them even wider in certain important instances.

Regarding glass in a screen of this type, it could extend from the top of the marble up to the first horizontal member, or from the top of the marble up to the cornice; or it could be eliminated altogether, whichever the banker might elect. Usually the glass is etched for the lower portion and clear above, or it may be, and sometimes is, clear throughout. We like to use an etched border on the glass to give it some distinction. A chipped glass may be used if preferred for the lower portion. No glass is used, of course, in the wickets. The bottom of the wicket must be kept $1\frac{1}{2}$ inches or 2 inches above the deal plate, and wickets may be simply hinged, or as we sometimes make them, hinged and partially telescopic. Bankers, as a rule, are not roofing the wire cages all over, as they formerly did. Instead of this we install a continuous wire hood at the top of the screen about 2 feet wide. This is supposed to prevent a thief from making a hasty jump over the



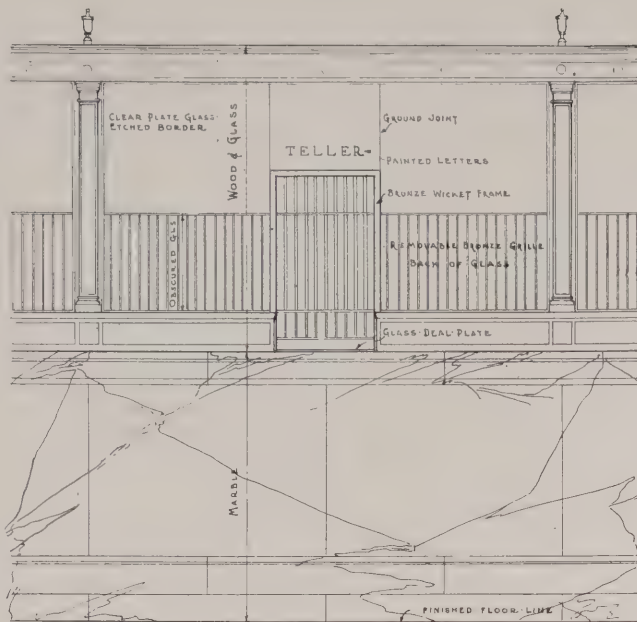
screen by stepping from the ledge. While a present-day thief hardly ever attempts this, it at least gives a slight feeling of protection to the teller.

The lighting of the counter from the screen is most important, and we provide a continuous reflector at the top and the back of the screen for this purpose. It should be arranged to light up in bays, with a pull chain back of each pilaster. The reflector should have a diffusing glass on the bottom to reduce the glare. It can easily be arranged so that this reflector with additional parts may be used to light the banking room by throwing the rays up to the ceiling. The reflector may also be used for lighting the sign in the frieze of the cornice, or a separate small reflector may be installed for the sign, as shown in the illustration. At this point it may well be said that no two banks require the same designation of wickets, and that each banker must be consulted to determine just what he requires.

In the selection of the marble, see that a sound marble is used, either domestic or imported, one that will require very little waxing, for the wax generally falls out after a year or two, producing unsightly work. If a highly veined marble is used, it should be backed up with a cheaper American marble. The color of marble selected should depend upon the color scheme of the room, but we strongly prefer a one-color marble that is without much veining, and one that is soft in color and rather unobtrusive.

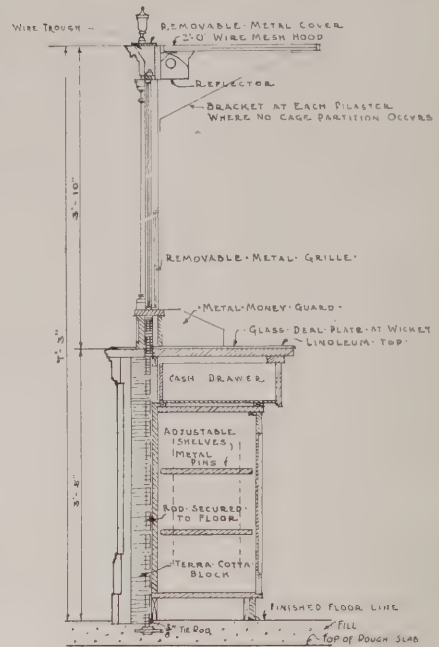
The ornamental work of the columns, pilasters and cornice of the screens shown in illustration "A," are cast bronze, while the plain portions are extruded. It is much more reasonable in cost if the cornice, for instance, is of extruded bronze with the cast portions applied, instead of the whole cornice being of cast bronze. The vertical bars in the illustration are of stock hollow shapes, a plain square bar set on the diagonal, and every other one twisted. These bars also have small and simple cast bronze caps and bases. The upright bars in the wickets are also of small, stock hollow shapes. The finest effect in cast bronze work is obtained by what is known as "lost wax casting," and such a casting is depicted in the illustration of the banking screen in the Federal Trust Company, of Newark, designed by Dennison & Hiron (p. 904). In ordinary bronze castings it is not possible to obtain any undercutting, but any degree of undercutting desired is possible with this process. It is very much more expensive to produce than the ordinary castings, however, owing to the fact that the wax model is destroyed in the process of casting and that instead of one model's serving for countless numbers of similar pilasters or other ornaments, a separate model is required for each column, pilaster or other ornamental feature.

There are many methods of designating the wicket. In screen "A," it is shown in the cornice, the letters being perforated on a bronze plate with ground

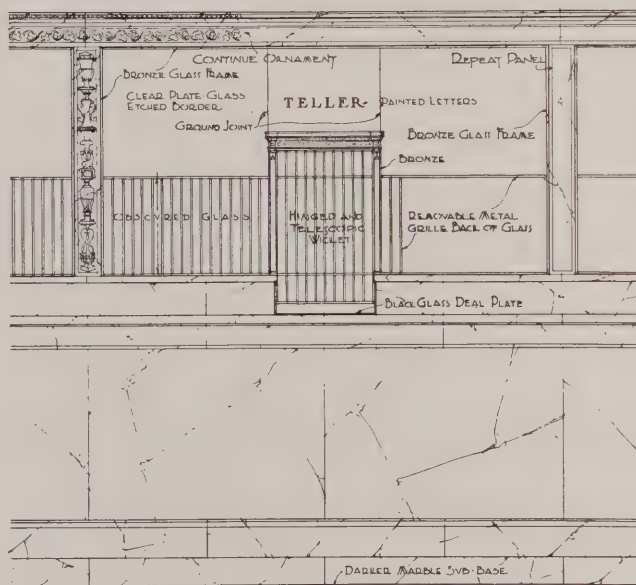


ELEVATION

C.

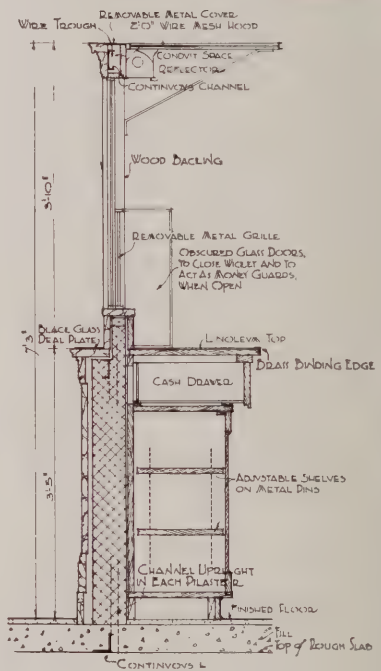
COUNTER SCREEN
WOOD & MARBLE
SCALE 1"=1'-0"

SECTION

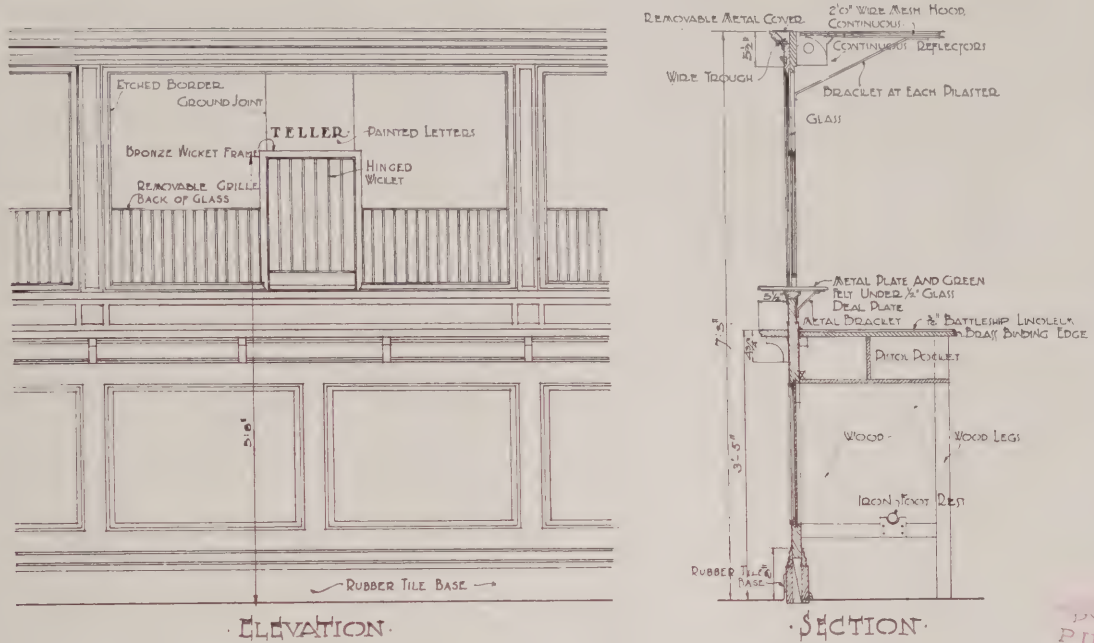


ELEVATION

D.

COUNTER SCREEN
MARBLE
SCALE 1"=1'-0"

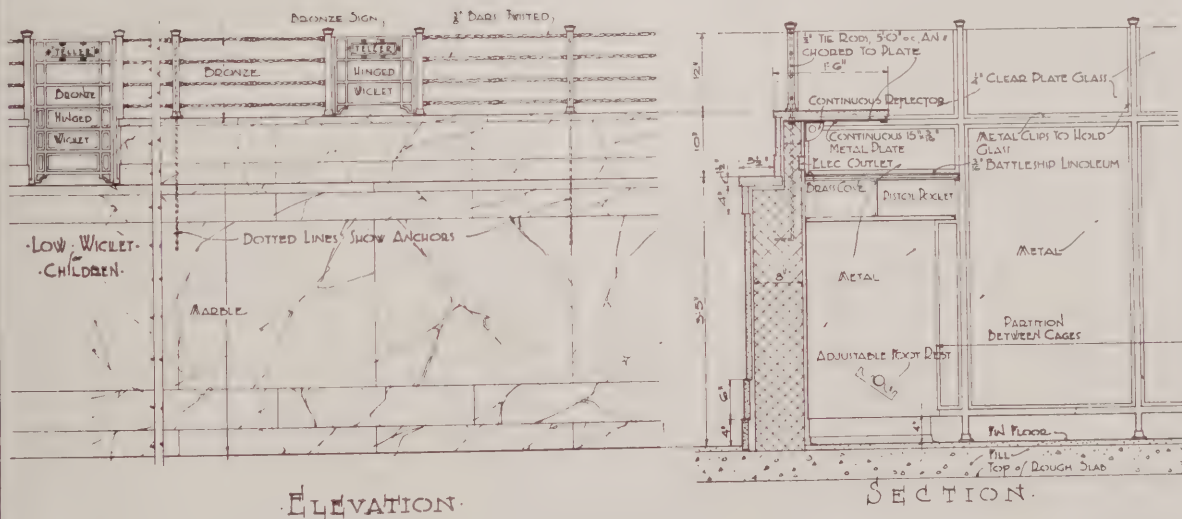
SECTION

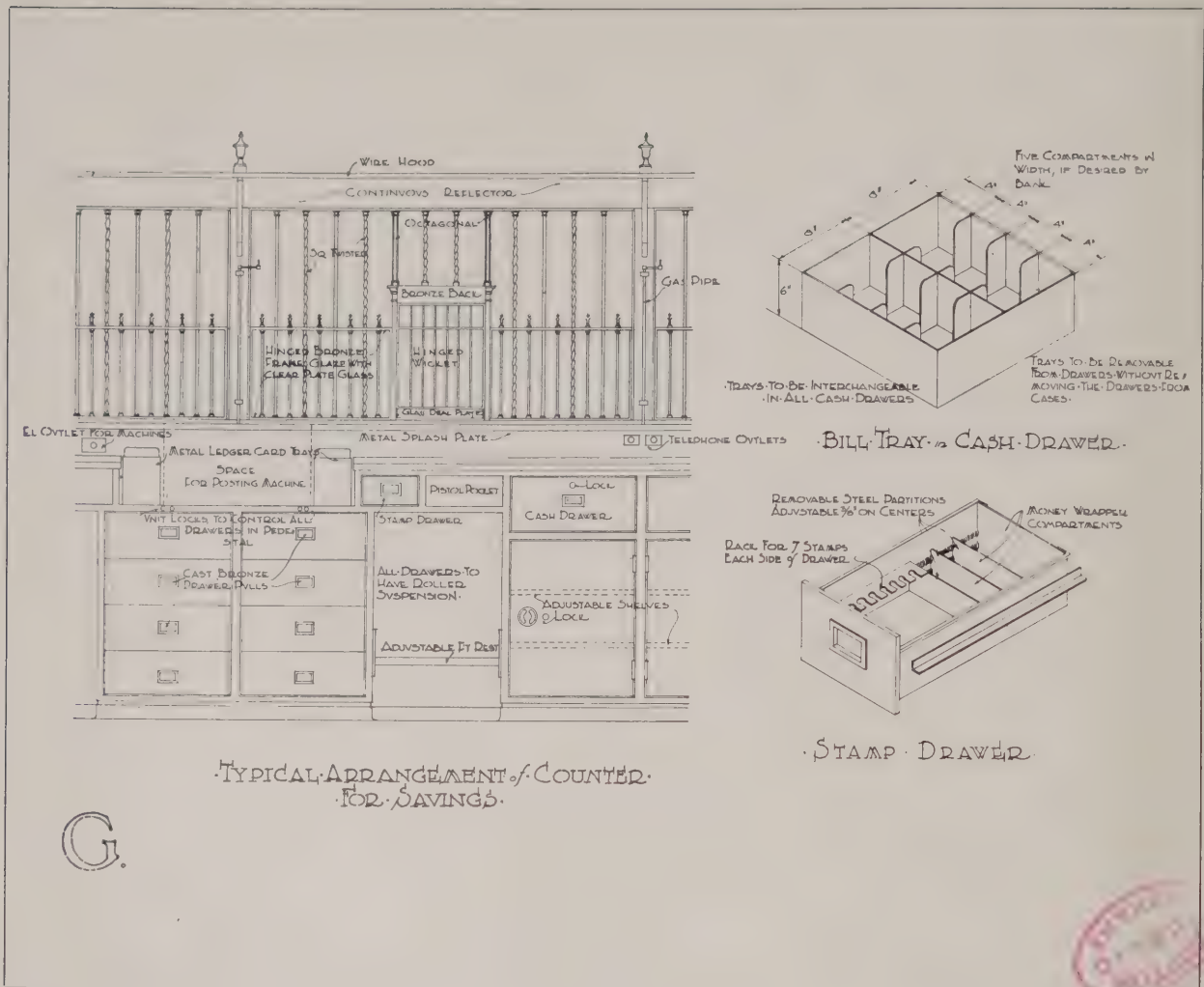


E.

COUNTED SCREEN.

WOOD
SCALE: 1/4" = 1'



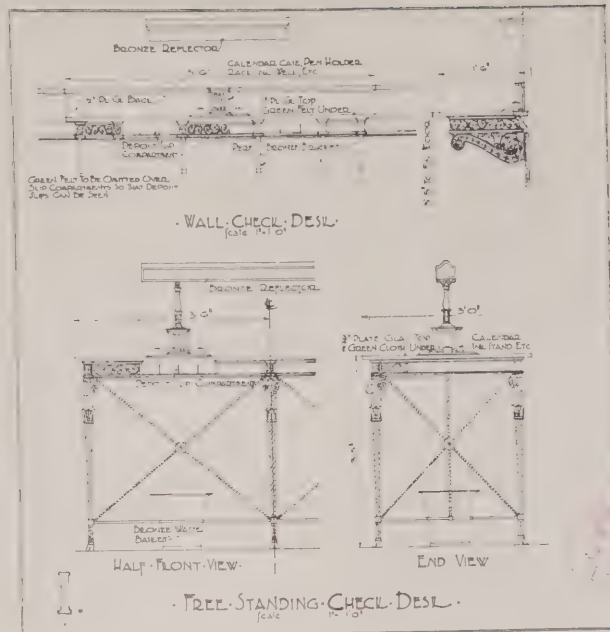
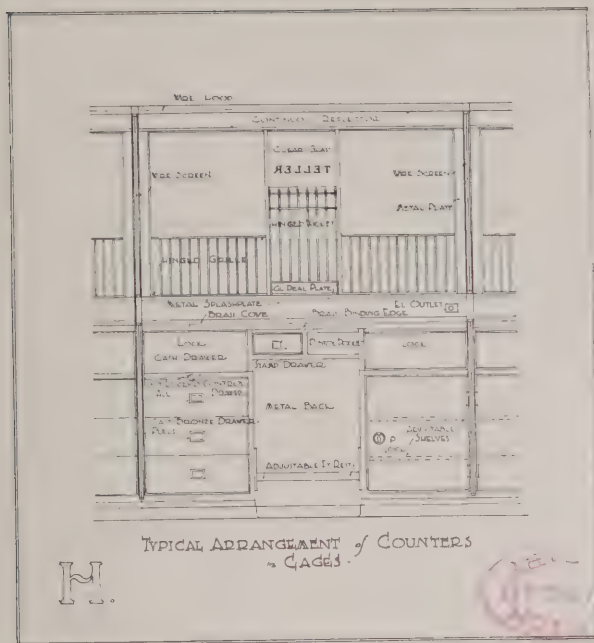


glass back of it, and a small reflector to illuminate it. We always construct these signs so that they are interchangeable. It is also possible to have the same kind of an arrangement in the small cornice just over the wicket, but the letters would of necessity be smaller. There is still another method in which the sign stands out from the frieze of the cornice at right angles to the cornice. It may be either illuminated or not, as desired. The simplest and least expensive method, which is just as efficient, is the painting of the letters on the plate glass in gold with black edging (to make them more easily distinguishable) just over the wicket. If the plate glass of the screen is made up in three sections to a bay, as we have shown in several of the cuts, these also become interchangeable. The plate glass, if completely filling the entire space between the marble and cornice, should be made up in three vertical sections with a ground joint between the sections, or a small plain or ornamented bronze section could be introduced to cover the joint, such as is shown in illustration "B." In earlier banks it was the custom to have one large sheet of plate glass with only a cut-out for the wicket, but the banks were usually forced to replace the glass very often, due to breakage caused by settlement in the building, or to a

heavy jar or impact or else to some other vibration.

We have found some bankers who wish to get away from the cold appearance of marble in a screen, and we have shown in illustration "B" a screen of which the lower part is wood. If richness is desired, it should be either mahogany, walnut or oak finished in soft tones. It could even be of wood painted, but unless the bank wishes to keep renewing the finish, it should be of the stained hardwoods, as just mentioned. It will be noted that this screen is constructed in the same manner as screen "A" except that wood is substituted for marble, and that another design of bronze upper screen is shown.

One illustration on page 904 shows a method of providing for a telephone to be used by two adjoining tellers. It shows a device that revolves and has a system of upright bars which always close the space between the cages, no matter which teller is using the telephone. Immediately under the telephone is a pass basket. The latter is an absolute necessity between the cages. There is also shown a detail of another type of pass basket, called a "tilting basket." We find this takes up much less room in a cage, where space is always at a premium, than the old type of wire pass basket that projected at least 5 inches into the cage on each side.



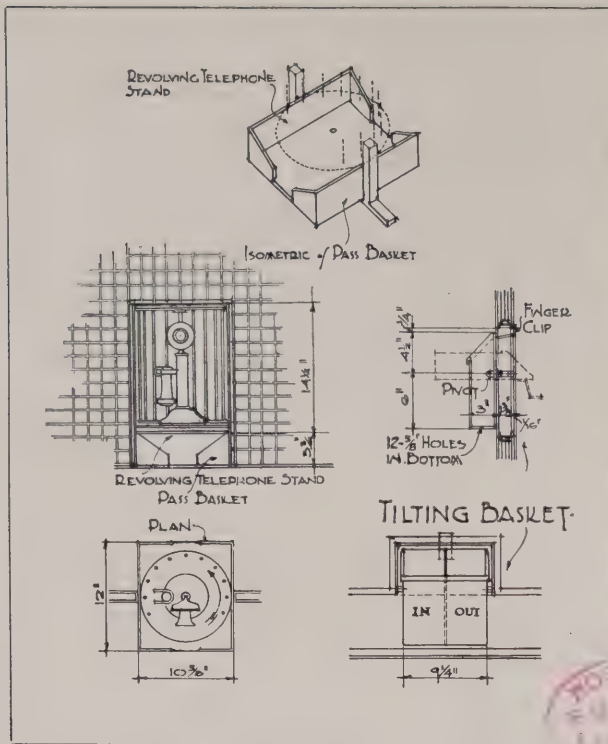
In illustration "C" is shown a modest cost screen with marble for the lower portion and wood for the upper part. We have shown this screen backed up with 4 inches of brick or tile rather than 6 inches. We do not believe the backing should ever be of less than 4 inches, and it is never necessary, in our opinion, to make it more than 6 inches, except where the low type of counter is used. This illustration shows a low wicket, and when low wickets are supplied for a screen, a bronze or baked enamel plate, approximately $\frac{1}{8}$ inch in thickness, should be supplied for each side of the wicket on the counter side, so as to prevent anyone so inclined from fishing through the wicket with a wire for any bills exposed on the counter. A better but more expensive money guard than this may be provided by having two hinged glass doors in small bronze frames, (as depicted in illustration "D"), which when open will act as the proper guards, and when closed will show that the wicket is not in use. On the glass may be lettered in gold the word "Closed." There are various means used to indicate that a wicket is closed, and a simple and inexpensive method is to have each wicket supplied with a thin mahogany panel (with a small brace on the back) on which the word "Closed" is lettered in gold. This panel should extend from the top of the deal plate up to the top line of the protecting grille back of the glass and should be the full width of the wicket opening.

In illustration "D" is shown a complete marble screen. The pilasters and cornice may or may not be carved, according to the taste and importance of the bank. It is necessary, for the support of an all-marble screen, to have a channel iron frame instead of the rod uprights required for the other types. Two-inch or 2½-inch channels may be used, one for each pilaster, extending from the floor to the cornice, with similar channel sections, one run-

ning horizontally just below the ledge, and the other at the cornice line. On account of the weight of the material and to get proper fastening, the channel frame should be used.

Inasmuch as we have shown a low wicket in this scheme, a word about the deal plate would not be amiss. We usually supply deal plates in black glass, hone finish, as this type of glass lessens the strain on the teller's eyes. It is $\frac{1}{2}$ inch in thickness and extends, in one piece, from approximately 1 inch from the front edge of the ledge to the back line of the counter. It should be countersunk so that it will project only $\frac{1}{16}$ inch above either the marble ledge or the linoleum on the counter top. It also should be the full width of the wicket opening. One-half-inch plate glass with black billiard cloth stretched neatly under it, may be used in lieu of black glass if desired. The deal plate for the high wicket shown on several of the schemes is of similar glass, the full width of the wicket, but about 10 inches in depth. In illustration "E" is an all-wood screen which is the most reasonable of all, in cost. No channel iron frame nor rod uprights are necessary. If cages which would give the screen stiffness are not to be installed, light rods will have to be run from the cornice back to the wall, or some other means must be devised to hold the screen properly in place. This type of screen may be constructed of any hardwood desired. It will be noted that we have supplied a ledge even for this screen, because we believe a ledge necessary, not only to afford a place on which to write while standing in line, but for the general comfort and convenience of the patrons as well. It will improve this type of screen if a bronze glass mould is used to hold the glass in place.

We have shown in these illustrations two schemes for the counter work, one for a business bank and



Left. Telephone Stand with Pass Basket Between Cages

Right. Tilting Pass Basket Between Cages



Bronze Bank Screen for Federal Trust Company, Newark

Dennison & Hiron, Architects

one for a savings bank. That for the business bank shows two pedestals (as the compartments at either side of the teller's leg-room are called), to a cage, although we have many banks that have only one pedestal; the equipment we have shown we believe is complete. We usually make the two drawers on either side of the wicket interchangeable, as tellers have distinct preferences in the matter of placing the cash drawer on the right or the left side. The knee space should be ample and not less than 20 inches in width. We usually arrange a rubber stamp drawer (as shown on sheet "G"), and also a pistol pocket just under the counter at the knee space. On the floor, in the knee space, should be the rod for the burglar alarm daylight hold-up system. There should be one rod for each teller, although in some instances we have installed fewer.

A typical metal cash tray that fits easily into the cash drawer is shown in illustration "G." This should be either four or five compartments wide and two sets in depth. When four are used, the teller places the \$1 and \$2 bills in one compartment, and the others are for \$5, \$10, and \$20. The cash drawer, whether of wood or metal, should be hung on ball-bearing extension hangers, so that the back compartment may be readily used. There should be numerous base receptacles and telephone outlets in the "splash plate," the vertical space between the top of the counter and the beginning of the grille.

Illustration "G" shows the counter work necessary for a savings bank, and shows a sinkage in the counter for the posting machine, used by a savings

bank, with space at each side of the machine for card trays. It is much more practical and makes a better looking counter in every way to arrange for the posting machine in this manner rather than have it set on the top of the counter. Sheet "I" shows a free-standing check desk and a wall check desk, both of which may be varied or simplified as the designer wishes. Both types must have slip compartments, a set of four or five for each patron. If it is a free-standing check desk, a set of compartments should be on each side; but if the desk is long enough to accommodate six or eight persons while writing, at least four sets of compartments should be installed with either three, four or five compartments to a set. A wall desk, if only 4 or 5 feet long, should have a set of four or five compartments. The glass on top of the desks is never less than 1/2 inch and is usually 3/4 to 1 inch in thickness and should be of plain plate glass with billiard cloth under it. It must be arranged, however, that the patron can see through the top of the slip compartments; in other words, omit the billiard cloth immediately over the compartments. Of course both types of desks must have good lighting facilities, reflectors preferred, and the necessary calendar cases with ink wells and pen trays, not to mention waste-paper baskets. The electric wiring for the lighting of a free-standing check desk leads from the reflector, is fastened to the under side of the desk, and then is carried through one of the legs down through the floor, terminating at a regular outlet box. At least this is the usual method of wiring it.

MATERIALS AND COSTS OF BANK INTERIORS

BY

WALTER CHARLES VOSS

CONSULTANT IN ARCHITECTURAL CONSTRUCTION

THE materials forming the interior floors, walls or ceiling surfaces of banking rooms may be divided into several basic classes for each of these elements of the structure. The *floors* may be finished in clay products, concrete, cork, linoleum, magnesite, natural stone, rubber or wood. The *walls* are usually finished in one or a combination of clay products, natural stone, plaster or wood. The *ceilings* may be finished in one or a combination of clay products, concrete, glass, plaster or wood, with painted or fabric finishes used in instances where desired. In most of these materials, interesting and pleasing effects may be obtained by a variety of colors, textures, shapes and sizes. *Durability and maintenance* costs are dependent upon such qualities as resistance to abrasion, fire, absorption and stains, and quality of workmanship. Variations in combinations of basic materials, as well as the selection of the material itself, will greatly influence character, and particularly costs. Many small units will increase application or installation costs, and irregular areas will increase cutting costs. At best, the values herein given are only general averages, intended as indications only.

Floors

Clay products vary in size, shape, color, and finish. As such, they present the most adaptable materials which the architect has for floor work. They may be divided into two general classes,—quarry and mosaic. Maintenance for these floors consists chiefly in repointing of joints and replacing of damaged or worn units, and may reasonably be classed as very low. Cleaning is simply and quickly accomplished. The ultimate cost for these floors should probably be rated as average.

Concrete is used in pre-moulded units or is cast in place to pattern. The past few years have seen an unprecedented development in this kind of work which makes this product exceedingly flexible. Ordinary concrete floors are not advisable for bank interiors, unless previously marked to pattern and then stained.

Terrazzo. The most common cast-in-place floor is terrazzo. This is combined with brass separation strips to form pattern and shrinkage planes. Color is almost invariably obtained by exposed aggregate finishes, although many use metallic oxide pigments



An Effective Use of Wood, Plaster and Wrought Iron



Granite Flagging for Floors; Carved Pine Trim with Pine Paneling and Ceiling

in addition. Pre-cast tiles are made with terrazzo and patterned effects, and variation in shape is produced as freely as with clay tiles. The maintenance of these floors takes the form of patching of cracks or oiling and waxing, and may be classed as low. The ultimate cost to the owner should be considered average.

Cork is either a "tile" or a "carpet." It is made as a natural product or as a composition employing pigments, gums and oils which slightly vary both color and durability. It is practically noiseless. The tile are obtainable in a variety of sizes, shapes and patterns, and some of the carpets are manufactured in patterned sheets or rolls. It is naturally of a somber color. *Linoleum* is in reality a cork composition product. It is made in plain and inlaid patterns. Maintenance of these floors is a matter of replace-



Interesting Tile Floor and Dado; Moulded Plaster Paneled Walls and Ceiling

ment in worn or stained areas and should probably be classed as high where traffic is heavy. The floor areas which are public receive exceedingly heavy and wearing traffic in most banks. The ultimate cost of such material would probably therefore be high for such work.

Magnesite compositions are usually plastics applied to structural floor surfaces, producing a seamless or a patterned effect. Their main interest centers in color variety. They are semi-flexible, and as such are reasonably quiet and comfortable. Maintenance of this type of floor will consist mainly of repairing cracks, and should therefore be low. The ultimate cost of this floor may also probably be considered low.

Natural stone is used as flagging or as tiles. The common varieties are marble, bluestone and slate, although in some instances granite has also been used. The effects produced are the result of natural color and grain, shape of unit and surface finish. The tiles or slabs vary from $\frac{7}{8}$ of an inch to 2 inches in thickness, with the former dimension most commonly specified. Where bluestone and granite are used, the thickness of the flagging will be from 3 to 6 inches. Maintenance of this floor consists mainly in repointing and in replacement of broken or disfigured units, and will be low. The ultimate cost may be classed as high, due to the cost of the original installation.

Rubber as a material for flooring is made in patterned tile or runners, and is produced with variety in grain and color. It comes in plain solid colors or in variations that simulate marble; the latter do not show soiling easily. It is in reality a composition for the purpose of toughness. It is resilient, and consequently quiet and comfortable. Maintenance of rubber floors consists mainly in surface treatments and washing to remove grit and dirt. It would be considered very low. The ultimate cost to the owner may be classed as low.

Wood is used for bank floors rather rarely today, but when employed is usually in a parquet or herringbone pattern. It is extensively used in the smaller rooms of banks, such as private offices and committee rooms. It is subject to the usual shrinkage and swelling common to wood floors and must be of thoroughly seasoned stock, carefully laid, to give bank service. Maintenance for these floors means constant attention to surface and opened joints, as well as to replacement of worn portions. This would make maintenance high. The ultimate cost would also be high.

Walls

Clay products when used for wall decoration and finish are usually confined to dados and scattered faience tiles embedded in plasterwork. The decorative tile is customarily used. The natural characteristics outlined under floor tile apply here as well, except that resistance to abrasion enters only slightly into the necessary qualifications. Maintenance is

again a question of joints and miscellaneous replacement, and is very low. The cost of such dado work varies from 75 cents upwards, per square foot in place.

Natural stone may be the interior finish of the entire walls of a banking room, and if so used is constructed in the same way as exterior work. Limestone ashlar is most commonly so employed. Veneers are used as dados, and marble is the customary stone for this sort of work. Maintenance resolves itself to pointing repairs, and care must be exercised where limestone ashlar is used to provide protection against ink stains when counter desks are placed as a part of the wall furnishings. Interior ashlar work varies in cost from \$1 upwards, and marble dados cost from \$1.50 upwards, per square foot in place.

Plaster is probably the most common medium for wall finish and is used as an all-over texture finish, as a base for painting, murals and tapestries, and is often most ornamental in character. Plasterwork is also often made to resemble limestone ashlar, travertine and Caen stone. At times these effects are produced by pre-cast blocks of gypsum or other material, which are erected in the ordinary fashion as for natural stone. Color interest as well as texture may be obtained by the use of manufactured plasters. All-over or ruled plasterwork is more subject to the cracks resulting from settlement than either natural or artificial stone facings, and maintenance is required early in the life of the building to remedy these defects. Where expensive paintings or murals are used, the results of such cracks may often cause extensive repair bills. In most cases it is wiser to have mural paintings on canvas placed against the plaster, so that they will not be subject to defects that might develop in the plaster. All-over textured plasterwork will cost in the neighborhood of 60 cents per square yard; ruled or jointed imitation stonework costs about \$4 per square yard; ornamental plasterwork will vary from \$3.50 for panel and moulded work to \$5 for heavily ornamented work, per square yard, over the average area; cornices cost about 35 cents per developed profile square foot, and mouldings average 35 cents per lineal foot, with each miter considered an additional lineal foot; pre-cast ashlar costs approximately \$12 per square yard, which includes the base course; mural decorations will depend entirely upon the talent of the artists employed in their production. Ordinary painted plaster surfaces vary in cost from \$1.50 to \$2.50 per square yard, for plasterwork and painting.

Wood is often used to form paneled wall surfaces. In order to conserve the natural beauty of the wood, stains and wax or varnish finishes bring the tones of the room down to darker values, which may be objectionable in some banks. The common woods so employed are oak, chestnut, mahogany and walnut. The paneled wall is subject to shrinkage, and maintenance, at least in the earlier stages of the life of the building, resolves itself into refinishing. The wood must be kept alive by occasional refinishing



Walls of Pointed Ashlar and Ornamental Plaster; Marble Dado and Trim; Cork Tile Floor

and must be maintained for scars, broken arrises and such disfigurements. Paneling varies in price from about \$1 to \$3 per square foot, for average work, although much higher costs are entailed where carving is specified.

Ceilings

Where *clay products* are used, timbrel vault construction is commonly specified. These tiles are laid in a variety of patterns and colors. They present fire-safe and easily maintained surfaces requiring only washing to bring them to their original condition. Occasional painting may be required also. Such construction, when independent of the upper floor frame, varies in cost with the spans and the decorations desired, but amounts to about \$2 per square foot of projected ceiling surfaces.



Plaster Walls and Ceiling; Marble Dado; Rubber Tile Floor

Concrete is being used extensively in the Far West for ceiling ornamentation. The beams, girders, slabs and even the columns are left rough as they come from the forms and are stained or painted to develop pattern, mosaic effects and endless ornamentation. The only surface cost in this case is the staining or painting, which amounts to about 30 cents per square foot as an average. Maintenance cost is negligible, as the surface of stained concrete is washable. When paint is used, the repairs must be made by complete replacement, when washing no longer serves to return the surface to its desired state. Concrete, in its original placing, may also be developed into reliefs, panels, and moulded ornament which take the place of the commonly used plaster ornament. Highly ornamented concrete ceilings, of course, increase the cost, directly chargeable to ceiling finish, but not as much as applied plaster ornament would, particularly where repetition of motif is possible.

Stained and ornamental leaded glass is used only where ceiling-light construction is feasible. This work may be carried out to a highly ornate and ingeniously lighted form, but in the usual instances will vary in cost from \$2 to \$3 per square foot. Maintenance cost in such cases is merely a case of washing or replacement of broken pieces and the re-

painting of supporting framework, and is moderate.

Plaster is most commonly used for ceiling finish, and the same finishes are used for walls, with one difference. The ceiling ornament is usually more profuse than the wall ornament, and moulded panels, coffer and stucco work are very commonly employed. The ceilings may be flat or vaulted, depending upon the effect desired. Ceilings of plaster are almost always painted with cold water paints, and redecorating, particularly where highly ornamental motifs and mouldings are used, is expensive. Plaster ceiling maintenance, if properly attended to, is by far the most expensive of all. The cost of reasonably plain moulded ceiling construction, painted, is about \$4 per square yard; for coffered, vaulted or highly ornamental flat ceilings, the cost will average from \$3 to \$6 per square yard.

When *wood* is used in ceiling construction it is almost entirely confined to beams and mouldings, very often supplanting moulded plasterwork as an economy. These beams may be stained and finished to harmonize with wall paneling or may be painted in tones to match the ceiling plasterwork. The cost of such work will be about the same as for wall paneling, and the total area should include the circumferential exposed dimensions of the ceiling beams.

MAINTENANCE AND COST OF FLOORS FOR BANKS

(HEAVY DUTY)

BASIC MATERIAL	NATURAL STONE			TERRAZZO		CONCRETE	
	Bluestone	Marble	Slate	Cast	Tile	Ordinary Stained	Pattern Tile
Resistance to							
(a) Abrasion	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good
(b) Fire	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
(c) Absorption	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Fair
(d) Acids-Alkalies	Good	Good	Excellent	Fair	Excellent	Fair	Fair
(e) Stains	Good	Poor	Excellent	Poor	Fair	Poor	Poor
Maintenance Req'd.....	Joints	Joints	Joints	Cracks	Joints	Oiling &	Joints
	Oiling	Replacement	Replacement		Replacements	Waxing	Replacements
						Cracks	
Maintenance Rating.....	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good
Approximate Cost Limits per							
Sq. Ft.	\$1.00 up	1.25 up	1.00 up	.50-.75	.80-1.25	.40-80	.50 up

BASIC MATERIAL	CLAY PRODUCTS		CORK	MAGNESITE COMP.		RUBBER	WOOD
	Quarry	Mosaic	Tiling or Carpet	Linoleum	Plain		Plank, Parquetry
Resistance to							
(a) Abrasion	Good	Good	Fair	Poor	Good	Excellent	Poor
(b) Fire	Excellent	Good	Poor	Poor	Fair	Good	Poor
(c) Absorption	Good	Fair	Fair	Excellent	Good	Excellent	Fair
(d) Acids-Alkalies	Excellent	Excellent	Poor	Poor	Poor	Excellent	Poor
(e) Stains	Excellent	Poor	Poor	Fair	Fair	Excellent	Fair
Maintenance Req'd.....	Joints	Joints	Replace-	Waxing	Cracks	Washing	Finishing
		Replacements	ments	Replacements			Repairs
Maintenance Rating	Excellent	Good	Fair	Poor	Good	Excellent	Fair
Approximate Cost Limits per							
Sq. Ft.	\$.65-80	.60 up	.45-.70	.30-.40	.20-40	.70-1.00	.40 up

THE LIGHTING OF BANKS

BY

WALTER STURROCK AND C. E. WEITZ

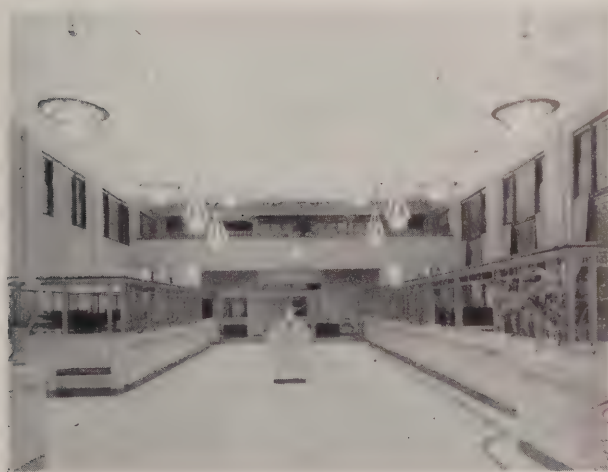
LIGHTING fundamentals, we are beginning to realize, lie deeper than any superficial standards set up in the drafting room of the engineer or the architect. Lighting is so intimately a part of ocular hygiene and conservation of vision that its use both in quantity and quality has been a subject of much study by the physiologist and research ophthalmologist. From these specialists the lighting engineer gets underlying facts which he, in turn, interprets in terms of equipment to provide illumination which meets the visual requirements. These underlying or foundational facts on how our eyes use light and how to safeguard vision have been learned only today, relatively speaking. The recent researches on light and vision give us a groundwork for practical lighting recommendations based on a more substantial foundation of facts than has been available heretofore. More has been learned about illumination, and more chapters have been written in the book of lighting progress in the last decade than have accumulated throughout all the periods of history.

In large banking areas, where a great deal of study is given to the architecture, the lighting system becomes of primary importance, not simply to meet the demands for ocular work but as a part of the decorative design of the interiors. Fortunately, these two demands of a lighting system can be coördinated readily, so that no longer should we find in any new interior lighting systems which do not meet all the requirements. The general requirements for good illumination have been set forth in so many published articles that it seems everyone should know them thoroughly. Emphasis is always placed upon the avoidance of excessive brightness or glare, the elimination of heavy dark shadows, the desirability of uniform distribution, and, —partic-

ularly of late,—the physiological need for a greater amount of light than is ordinarily provided. These general requirements need no elaboration here.

Choice of Equipment. It goes almost without saying that the lighting fixtures employed in banks should be decorative and of pleasing appearance, both lighted and unlighted. The actual choice of equipment must depend on the character of the architecture, height of ceiling, color, columns, and such factors. Fixtures of the direct type add life and action to an interior and are the most efficient, but the system must be handled with care if the light is not to prove distracting and uncomfortably bright. Where exposed-lamp fixtures are desired to carry out a definite motif, it is well, where possible, to design the fixture around a central high-wattage diffusing unit to supply the main source of illumination, using small lamps merely to carry out the effect. Semi-direct or indirect equipment produces a soft, comparatively shadowless illumination, and may be designed to create an atmosphere of restfulness, stability, or severe dignity as desired. Lighting from equipment concealed in urns, wall pockets, or coves is pleasing, since it emphasizes architectural detail and seems to expand the dimensions of an interior. Supplementary decorative wall and column brackets, well shaded, add a touch of color and life. In all applications requiring a sufficient amount of light to permit comfortable working vision, the trend is distinctly away from lighting fixtures of the multi-light chandelier type as the primary light source. Such fixtures have some decorative significance, but they are relatively inefficient, and unless mounted very high, are usually sources of glare.

With these brief comments, let us leave the matter of fixture type for a moment and consider the



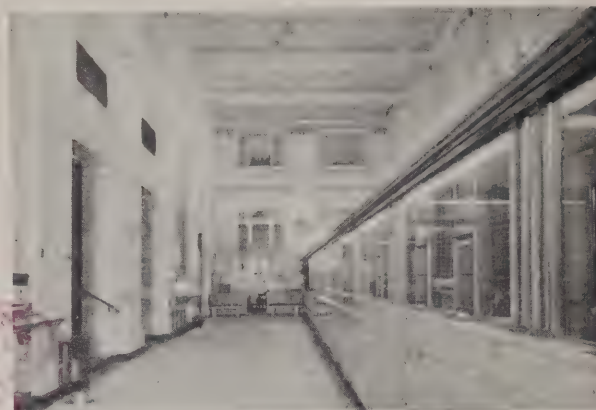
Pleasing Effect of Semi-Indirect Lighting Units



Spaciousness Gained by Absence of Ceiling Lights



Bare-Lamp Fixtures Are Often Harsh in Effect



Indirect Light from Above Cages Floods the Room

related question of amount or "level" of illumination, expressed in foot-candles. "Level of illumination" is the term used by lighting engineers to indicate the amount of light; a high level of illumination refers to a relatively large amount of light, and a low level to poorer illumination. The meaning of the term, foot-candle, as the unit by which the level of illumination is measured, is generally understood. It may be readily defined; 1 foot-candle represents the level of illumination on a surface 1 foot away from a light source of 1 candle, and perpendicular to the light rays.

Level of Illumination. Too many fixtures are installed, even today, with little regard to their performance as lighting devices. The lighting results are sometimes deplorable. It is surprising how many times certain lighting engineers have been called in to correct faults in bank lighting after an installation is put in and is working. Sometimes these complaints are due to glare, but in most cases it is simply a matter of insufficient illumination in the working areas. The question of the level of illumination has of late engaged major attention by reason of data from research laboratories as well as under working conditions. The experiences show that, with the average amounts of artificial lighting prevailing today, our eyes cannot see as easily, as quickly, or as accurately as they are capable of doing. As a result, much muscular and nervous energy is expended through eye strain and eye fatigue under low illumination, and we are confronted with an astonishing prevalence of eye defects.

The amount of light recommended for banks is 10 foot-candles for lobbies and banking rooms, and 15 foot-candles for cages and offices. These units of illumination, while not ideal, are generally accepted as reasonably adequate for the visual requirements of banking, assuming that care is taken to diffuse and distribute the light properly. With an acceptable standard of illumination set down as a starting point, the problem is then one of choosing methods, equipment, and wattage by which to accomplish the result satisfactorily, and which, at the same time, remains answerable to a treatment

which enhances the importance of the architecture and is in harmony with the spirit of the interior. It would be serious if a lighting installation did not first and foremost measure up to its responsibilities from a utilitarian standpoint; and second, it would be unfortunate if advantage were not taken of its further possibilities to create a pleasing effect.

Lamp Sizes and Efficiency. The discussion of this subject will be facilitated by the introduction of another term, the "lumen." The lumen is the unit in which the light output of a light source is measured. Modern lamps are all rated in lumens of light output. The larger the lamp, the more efficient it is, as measured in lumens per watt. Table I shows the lumen output and lumens per watt efficiencies for several representative lamp sizes. The lumen output for lamps of all sizes may be obtained from the lamp manufacturers.

Lamp Watts	Lumen Output	Lumens Per Watt
25	235	9.4
100	1320	13.2
500	9500	19.0
1000	22000	22.0

As is evident from Table I, it is always more economical, other things being equal, to use a small number of large lamps than to use a large number of small lamps to obtain a given foot-candle level of illumination.

How To Get 10 Foot-Candles. If 1 lumen is evenly distributed on a surface of 1 square foot, the level of illumination on that surface is 1 foot-candle. Therefore, a level of illumination of 10 foot-candles means that there will be 10 lumens per square foot actually delivered on the working plane over the entire area in question. Knowing the number of lumens wanted on the work, the problem is that of determining the number of lumens absorbed in the equipment and the number utilized on the ceiling and walls, in order to determine the total number of lumens required. For accurate lighting computations, the various text books and the bulletins of the lamp manufacturers should be consulted. The design procedure takes account of such factors as ceiling height, room size, and color



Freedom from Glare in Office Space; Semi-Indirect Lighting



Shaded Wall Brackets and Desk Lamps in Executives' Office

of walls and ceiling, all of which influence the resulting illumination. Table II is presented as a means of obtaining a rough check on the lamp lumens required with three different types of equipment, assuming a room of average size, with a light colored ceiling.

TABLE II

A Rough Check on Where the Lamp Lumens Go

Type of Equipment	Absorbed in Equipment	Allowance for Depreciation	Absorbed by Ceiling and Walls	Reaches Working Planes	Total Lumens Multiplier
White Glass Enclosing Globes	20%	20%	30-35%	25-30%	3-4
Indirect and Semi-indirect Units	25%	25%	30-35%	15-20%	5-6
Concealed Units—Cove Lighting	30%	25%	30-35%	10-15%	7-10

The "Total Lumens Multiplier," in the last column of Table II, may be used as a short-cut figure for determining roughly the total lamp lumens required to light a given banking area. For example, if a bank lobby 50 feet by 100 feet is to be lighted to a level of 10 foot-candles, multiplying the area, 5,000 square feet, by 10 gives 50,000 lumens to be delivered to the working plane. Say semi-indirect lighting is to be employed, for which the multiplier is 5 to 6. The lamp lumens generated must then be in the vicinity of 50,000 times this multiplier, or 250,000 to 300,000 lumens.

Decoration and Lumens. At first thought these figures may imply a decided inefficiency in the use of electricity to produce a desired illumination on the working plane. It should be remembered, however, that a considerable percentage of the lumens shown as absorbed by the ceiling and walls are reflected back and forth between these surfaces and, though wasted as far as lighting calculations are concerned, are highly useful from the standpoint of general effect. These are the lumens that brighten up the interior,—that reveal architectural beauties and lend general character to the interior. In this connection

a dozen large banks were recently inspected and foot-candle readings taken in the main banking rooms. It was found that the working light measured from 2 to 6 foot-candles. Many of these rooms seemed dull and somber, out of step with the progress and spirit of the age,—in fact, out of keeping with their real ideals as reflected in modern bank advertising. One survey in complete detail of the electrical advertising used by one large banking house with over 50 branches indicates that the lighting employed for outside advertising purposes alone is comparable in amount to that used for interior lighting. Admittedly, it is important for banks to create favorable impressions by means of effective outdoor advertising. But is it not of equal or of greater importance for the interior lighting of the bank to be such that it too creates a favorable impression upon those who enter to transact business?

Lighting the Lobby. While the use of all bank lobbies and consequently their lighting requirements from the standpoint of vision are the same, the methods of lighting do not admit of any degree of standardization because of the wide diversity in architectural treatment. Examples range from the simplest store-like interior to those of highly ornate character with high vaulted roofs not unlike those of churches. The types of lighting may range from the orthodox suspended ceiling fixtures to such highly specialized methods as lighting from concealed sources,—coves, artificial skylights, and windows,—incorporated in the architectural plans.

Cage Lighting. It is a generally accepted fact that the work done by tellers and clerks requires more light than the lobby proper, and this has resulted in the almost universal practice of installing above the windows standard cage lighting units consisting of continuous troughs with small lamps behind diffusing glass cover plates. This is a very satisfactory form of supplementary lighting, and if the general illumination of the banking room is of the order of 10 foot-candles, this supplementary system will build the illumination up to that of the 15 foot-candles recommended. Foot-candle readings taken in a number of instances showed only 6 to 10 foot-



Overhead Lighting and Individual Lights



Semi-Indirect, Totally Enclosed Lighting Units

candles on the tellers' desks, but in these cases the general lighting ranged from 3 to 6 foot-candles. The deficiency, therefore, was in the general lighting of the room as a whole and not in the supplementary cage lighting. Because the prevailing levels of bank illumination are below the accepted standards, it is probably true that we find more local desk lighting units and more eye shields used by bank employes than by many other classes of office workers. In three cages in a large main bank a total of 13 individual desk lamps was observed. The inevitable result of such practice is splotches of high intensity light amid general gloom,—a lighting condition which ophthalmologists would have us avoid if we are to conserve our eyesight.

Offices. The level of illumination recommended for private and general offices in which close work is done, is 15 foot-candles, while for those offices in which little or no close work is done, 10 foot-candles suffice. In either case, where the ceiling permits its use, indirect or semi-indirect illumination evenly distributed over the working area should be employed. With such a system no individual desk lamps are necessary, and the attendant abuses and misuses

are avoided. In many of the smaller banks and branches, where the general office work is done in sections adjoining the tellers' cages in the main banking areas, it is sometimes difficult to obtain the desired level of illumination from the overhead general lighting system. In these cases special lighting should be provided, such as sidewall brackets, supplementary overhead illumination, or well designed table lamps. A well designed table lamp might be defined as one which, by its construction and location, illuminates the table top adequately without glare,—either direct or reflected from the table top,—into the eyes of anyone working in that vicinity. Indirect lighting presupposes there being a ceiling and interior finish in light colors. Where such conditions do not prevail, there has been the inclination to compromise, because of otherwise poor efficiency, on direct lighting with white enclosing glassware; but whether this is the proper compromise is a debatable point in view of the trend toward higher levels of illumination. Better, perhaps, would it be to insist that interiors be finished with reference to the illumination system rather than the reverse, if we were to consider efficiency only.



Luminous Information Signs Are Used to Advantage



Luminous-Bowl Indirect Units Give Diffused Light

NOISE PROBLEMS IN BANKS

BY

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THE necessity of producing quiet surroundings in banks and business offices, not to mention other types of buildings such as hospitals and schools, is daily claiming more and more attention. This is due to facts developed in various lines of research and experience, all pointing to the one conclusion. Medical science, for instance, informs us that there is a chemical and physiological action produced in the nervous system by prolonged exposure to noise, and that the resultant fatigue may go so far as even to cause collapse. Statistics in the medical department of one of our large banks showed an immediate and marked drop in the number of cases treated daily among the women clerks after the noise in the working rooms had been diminished. Experiments in psychology, as well as operating tests by office managers, show that the change from noisy to quiet surroundings results in greater freedom from errors and that more work is accomplished.

An interesting experiment was lately made by Dr. Donald A. Laird, of Colgate University, described in an article on "The Measurement of the Effects of Noise on Working Efficiency," published in the *Journal of Industrial Hygiene* for October, 1927. Dr. Laird found that 19 per cent less energy was consumed by a typist when working under quiet

rather than under noisy conditions. The rapidity of work was also affected, there being an increase of 7.4 per cent in speed in the case of his most rapid typist when in quiet surroundings. Furthermore, under these conditions, there was an increasing output of work with the lapse of time, as the typist "warmed up," while the reverse was the case under exposure to noise. These results are verified by tests in the bank before mentioned, where the introduction of sound-absorbing treatment in a large adding machine room housing several hundred employes caused an average shortening by several minutes of the time necessary to do a stated amount of work every day. The statement is sometimes made by office managers that noise is soon relegated to the subconscious mind, that workers have become accustomed to it and do not think about it, and that the expense of installing absorbent materials is needless and wasteful. Nothing could be more untrue. Many workers of sensitive temperament are unable to shut the noise out of their consciousness, while even those more fortunate individuals who have the ability to concentrate do not for that reason escape the fatigue and loss of energy which inevitably occurs, even if subconsciously, as researches have established.

Modern science, having in some of its branches



Noise Problems Are Often Negligible Where Surfaces Are Small and Varied



The Open Office Spaces and Many Machines of Modern Banks Complicate Noise Problems

established the fact that noise is undesirable, unhealthful and uneconomical, proceeds through other of its branches to develop and use materials and methods of building construction which produce the maximum of noise. This is due primarily to the demand for fireproof structures and for sanitary surfaces susceptible of frequent and easy cleaning. Consequently, we have the ever-increasing use of concrete, hard plaster, glazed tile and brick, terrazzo, stone, marble and the like. Even the office furniture and partitions are frequently of steel. What happens in a room finished in these ideal sound-reflecting materials? The pound of an adding machine lever, the click of a typewriter key, the ring of a telephone bell, the scraping of a chair,—any sound,—once produced in such a room, will send out a train of sound waves into the adjoining air. These waves travel until they meet the hard surfaces in every direction and are there reflected back on themselves with little loss of energy. The waves from one little sound will continue this process of reflection many hundred times, crossing and re-crossing, before their energy is finally dissipated. This takes several seconds of time, during which new sounds are being created to add their energy to the first and to one another. This causes an accumulation and consequent magnifying of sound in the room such as would not exist if each train of sound waves were fully absorbed in the course of only a few reflections. Add to this the increasing number of labor-saving but noise-producing office devices, and we find that the tendency is to make our offices more noisy instead of less so.

Of course, this is a condition which should not be tolerated. In every other direction, consideration is given to the comfort and health of the worker as affecting his efficiency. Lighting systems are carefully planned to give uniformly diffused illumination with the requisite number of foot-candle units at

the desk. Colors of walls and positions of windows are carefully considered. The exact degrees of temperature and humidity most conducive to efficient output are studied and often secured. The flow of fresh air, its velocity and direction, and the percentage of carbon dioxide accumulated are all worked out with care. Even the best method of chilling drinking water has been made the subject of study; on a par with these in importance is the reduction of noise. The old adage concerning the value of an ounce of prevention is, of course, the first thing to remember. Floors should be covered with noiseless materials such as linoleum, cork or rubber tile, mastic preparations or the like. Machines should be of the "noiseless" variety as far as possible, or else segregated in one room which can be quieted. Harsh telephone bells should give way to mellow buzzers. When all such precautions have been taken, however, there must still remain a large amount of unavoidable noise, and it is of the utmost importance that this shall not be magnified by the reflecting process within a room. Sound-absorbing materials must be introduced in sufficient quantity to reduce the reverberation to a minimum.

The materials used for such purposes may be roughly divided into four classes,—furnishings, fiber boards, felts and masonry materials. The use of carpets, heavy hangings and stuffed furniture is not practicable for the average business office, except in such rooms as those for directors and executives, or for conferences. In such rooms rugs or carpets lined with half-inch felt, heavy curtains interlined, and overstuffed chairs and divans produce all the absorption required. In public and work spaces, however, and even in the average private office, such furnishings are undesirable and out of place. Hence, in the vast majority of cases, one must turn to use of materials of the other three classes which can be permanently placed on ceilings or walls, or both, and



The Treatment of Walls and Ceilings Affects the Acoustic Qualities of Banking Rooms

which will be pleasing in appearance and effective.

Let us first consider the fiber boards. These may sometimes be open to criticisms on the score of appearance, lack of durability, poor light reflection, or even low resistance to fire, but such is not always the case, and there are many places where their use is particularly desirable. They are usually low in cost, and some have the highest absorbing value of any material. They are semi-rigid and consequently easily handled. There are many types on the market, of varying degrees of efficiency. In general, the more compressed the board the less porous it is, and consequently the less efficient as a sound absorber. On the other hand, if it is but lightly compressed in manufacture, so as to form a spongy material, it may absorb a great deal of sound. This is particularly true of those boards which are perforated or scored in order to offer a greater surface to the sound waves. Fiber boards are made of sugar cane refuse, flax, wood fiber, excelsior and the like, varying widely in absorptive value with the thickness, degree of compression, amount of perforation, and the pitch of the sound.

In the class of felts, there are also a number of kinds, all nearly equal in efficiency, thickness for thickness. They are made of cattle hair, goat hair, jute, wool, shredded wood fiber and other substances. In some cases the fibers are simply felted or matted together, while in others, known as "punched" felts, the fibers are pushed through an interlining of burlap or some similar fabric which holds them in place and produces a firmer and more durable material with less likelihood of shearing of the face from the back than in the ordinary felting process.

Masonry materials are sometimes of tile and sometimes of plaster. There are several types of each. Being rigid substances with little or no flexibility, they rely almost entirely on their porosity to absorb

sound. For this reason, different kinds vary considerably from one another according to their manufacture and application as affecting the number, extent and size of the intercommunicating pores which dissipate the sound energy. Of the tile, some are fired and some are cast. They are particularly desirable for vaulted ceilings or for wall ashlar where a true structural effect is sought. They form a permanent finish which does not deteriorate, which is fireproof, and which has a high acoustic value. They must be placed in the front rank of corrective materials. The plasters also are of several kinds. Some have their pores formed mechanically by uniformly graded aggregates, some chemically by effervescence, while in one type the holes are punched in the wet plaster by fine wires. The plasters, like the tiles, are fireproof, and are as durable as any standard plaster.

In choosing a material for sound correction, careful consideration must be given to the variation in absorption over the scale of pitch. There is a wide difference of results in this respect, and no material can be used intelligently unless reliable data are available showing the percentage of absorption over at least the most important region of the scale of audible tones. A material which will correct an auditorium for the hearing of speech may be entirely unsuitable for the hearing of music. Again, a finish which may be proper for music or speech, or both, may have almost no effect in absorbing office noises. The prevailing characteristic of office sounds seems to be the prevalence of very high pitches lying three, four or more octaves above "middle C," that is, from 2000 cycles up. In order to be effective as an office quieting agent, therefore, a corrective material must have high absorption at these upper pitches, regardless of what it may have in the lower scale. Some of the materials we have considered have this property and some have not. Some, which in themselves

are satisfactory, lose their efficiency when a decorative finish is applied.

This brings us to what is undoubtedly the most serious problem in the practical field of securing quiet in offices. In order to reflect light in sufficient quantity, and to present a surface pleasing in appearance, many absorbents must either be painted directly or concealed by a painted cloth covering. Especially in the latter case does this more or less impervious layer of paint constitute a barrier to the passage of the sound waves into the absorbent structure beneath, and this effect is most marked at the high pitches already mentioned as most difficult. The result is fatal to an effective result. On the other hand, if the surface is not painted and the pores are left open to the impinging sound, these same pores accumulate dirt and the surface becomes soiled so that both appearance and light reflection are impaired. The ideal solution would be to use over the absorbing material a coating which would be impervious to dirt, permitting passage of the shorter sound waves, and yet reflecting the light. Furthermore, the surface should be capable of being washed or redecorated or otherwise renovated without deterioration. Such a coating has yet to be discovered.

We have here one of the great objections to the use of felt and some fiber boards. Those which are naturally dark in color require such a heavy coating to build up the light reflection that the sound-absorptive effect is too greatly diminished. Various schemes have been tried to overcome this difficulty, but none is wholly satisfactory as regards either appearance or permanence. Light colored materials on the other hand, like the tiles and plasters and some of the fiber boards, can be sprayed or stippled with a thin paint, such as water color, without serious damage to the absorption. The cast tiles, which have a fairly smooth surface, can even be washed and scrubbed when necessary. Apart from the effect of the decorative coating on the absorption of sound, we must consider the actual absorbing curve of the material itself. Obviously, those substances which have low absorption in the higher register must be ruled out. Use should be made of only those materials which show a high percentage of absorption above 2000 cycles, as otherwise the area of treatment required becomes so great as to be too expensive and often entirely impracticable.

Among those materials which show a sufficiently high degree of absorption in the upper pitches, it is interesting to note another feature. Laboratory measurements of absorption have thus far been limited to an upper boundary four octaves above "middle C" (4096 cycles). The limit of human audition is far above this. Whether any considerable portion of office noises consists of sounds above this pitch, and if so, whether they have any marked effect on the ear or nervous system, has never been demonstrated. If, however, these higher pitches should prove to be of importance, it is evident that those materials showing an ever-increasing per-

centage of absorption as they approach the pitch of 4096 cycles may fairly be assumed not to fall off sharply for some reasonable distance beyond this point and therefore to be more effective in this region than materials showing a descending curve at 4096 cycles. Of all the absorbent materials in use, the acoustical plasters alone show an ascending instead of a descending curve at the point mentioned. While, of course, too great a stress must not be laid on this fact, it is interesting to observe it, and future experiments may determine how far it is an argument in favor of the use of such materials.

It is a matter of congratulation that the need for quieting treatment is daily becoming more and more recognized and that new materials and methods are constantly being developed to meet this need. There are now about 30 such on the market. Caution must be exercised, however, regarding materials for which unjustified claims of acoustical efficiency are made. Because a surface is rough in texture or pitted with holes, it does not necessarily possess absorptive qualities. Nor does the presence of a number of sealed and isolated air cells in the interior give any absorption for reflected sound, although this does decrease the transmitted sound. Again, resilient material like cork and rubber, while preventing the production of sound, do not absorb incident sound waves to any marked extent. For high absorption, the cells or pores must be intercommunicating, fairly uniform in size, and of critical diameter; in other words, the material must have a texture throughout its mass much like sponge or coral with diminutive pores.

In our banking institutions a large field is presented for the use of these materials and quieting methods. The lofty and monumental spaces used by the public should be freed of their cave-like resonance; cages of tellers and clerks should be quiet to insure speed and avoidance of mistakes; adding and statistical machines, typewriters, telephones, switchboards and telegraph instruments should be segregated in treated spaces for the welfare and efficiency of the operators and the comfort of the others; conference rooms and executive offices should be quieted to insure privacy. The question is sometimes raised as to the desirability of subdividing working spaces into numerous small offices by partitions running to the ceilings. In general, this is not to be recommended from the acoustical standpoint. It is usually better and more effective to apply general treatment to a large open space than to treat small individual offices where the ratio of the ceiling area to the other surfaces is much smaller than in the large rooms. Low partitions, such as those enclosing cages are, of course, permissible.

Even in the brief survey of the matter made here, there should be facts sufficient to demonstrate not only the necessity of quieting but also the desirability of an intelligent study of the methods and materials to be used in any case. A little forethought will save much annoyance, criticism and expense.

BANK VAULT CONSTRUCTION AND EQUIPMENT

BY
FREDERICK S. HOLMES
VAULT ENGINEER

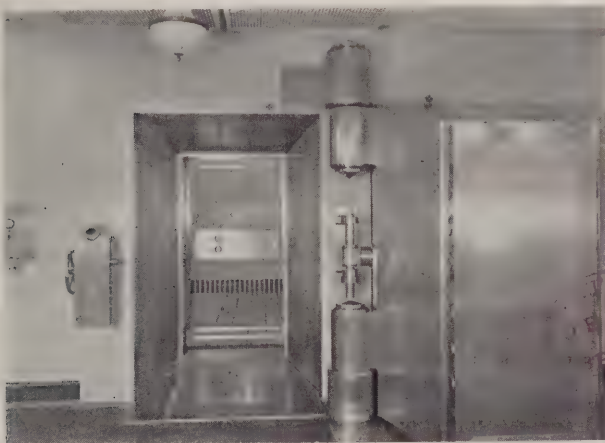
THE history of bank vault design has had little influence upon today's planning. While it is intensely interesting in the many changes in both principle and detail evolved to withstand the ever-developing technique of burglar attack, and while it becomes absorbingly fascinating when those changes are related to their causes, such retrospection is almost useless in planning a vault capable of resistance commensurate with the actual and potential powers of the skilled burglar of today.

For half a century the fundamentals of protective strength in vaults remained practically static. There were some modifications to offset the introduction of the use of nitro-glycerin as a part of the attacking equipment, and refining of mechanical detail and securing better machine finish were developed, but on the whole, all demands were being met satisfactorily. Then suddenly the cutter burner, the fluxing rod, the electric chisel and hammer, and even the oxygen pipe, were prostituted to burglarious purposes, creating almost overnight a really terrifying menace that necessitated equally revolutionary changes in design and construction. Resistance-time values fell tremendously, and they are still low when related to construction costs as compared to those formerly obtaining. It took the vault designers and builders several years to adjust the industry to the new forms of menace. And though it is not possible, even utilizing the best available materials, to design a vault within reasonable cost limitations that would resist successfully a fully organized attack by the best known experts for more than a comparatively few hours, the situation is not as dangerous as might be inferred.

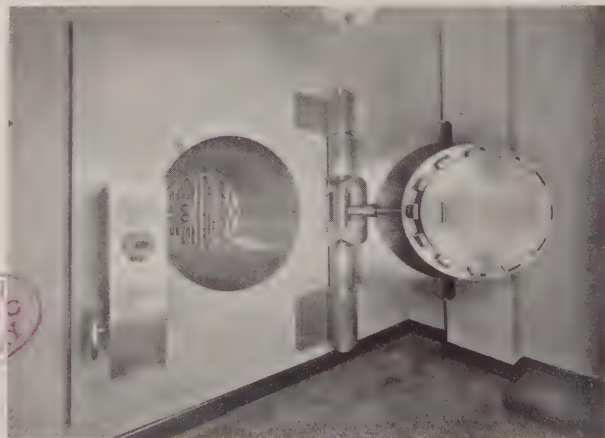
Any menace from the experts is quite remote, for they are few in number, well known, and employed in legitimate industry. Were they to become burglars, being men of intelligence they would not attack high class construction, involving some hours

of the hardest kind of work and a large investment in equipment, when with their skill and the most rudimentary of outfits they could successfully burglarize most of the existing vaults in the country in a surprisingly short time. Moreover, it is relatively easy now, at reasonable cost, to provide protection that is adequate to resist attack by all burglars other than the known experts.

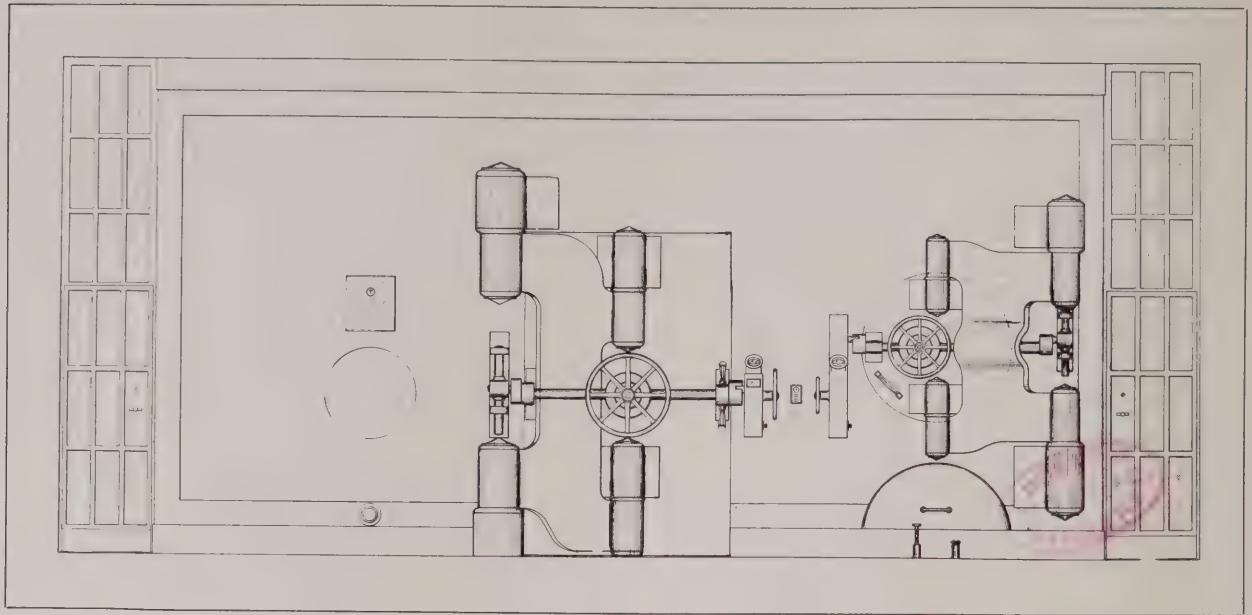
The Vault. What constitutes a vault that today provides adequate protection? Engineers, whether acting as consultants or employed in the industry, disagree upon details, but they are in agreement upon fundamentals. There is no doubt that protection against fire is best served by the use of reinforced concrete walls; that tool, torch, and shock resistance is afforded with composite metal linings or inter-linings; that a single and thick door with few or no rebates affords the most protection for a given cost, with emergency doors provided in an otherwise single-door vault; that the entire structure should be so located as to afford free observation upon all its six sides; that electrical protection is essential; and that liberal ventilation must be assured. But opinions regarding the details to be employed in providing these fundamentals differ more widely than is warranted by an analysis of the known facts. Perhaps the greatest diversity of opinion is exhibited with respect to the value of reinforced concrete walls without linings or interlinings where dependence is placed upon such construction for burglar resistance as well as fireproofing. This is a most important question, because the correct answer is essential to providing adequate protection under present-day conditions. The disagreement arises from three causes—(1) sales competition, influenced by the effort to obtain contracts through low prices; (2) the lack of adequate requirements for low burglary insurance rating through the manual which is based on what might be termed "vault mortality tables"



A 36-Inch Emergency Door



A 36-Inch Security Door



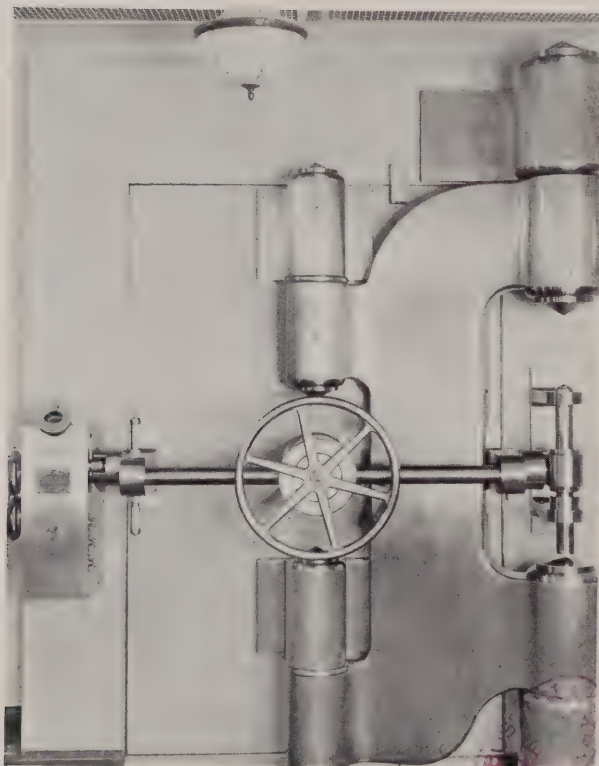
Front Elevation of Vault, Showing Ventilating Hood Depressed

rather than upon the actually known resistance value of the constructions rated, as determined by unprejudiced tests; (3) and perhaps most of all through the broadcasting of peculiar interpretations of evidence produced by various tests.

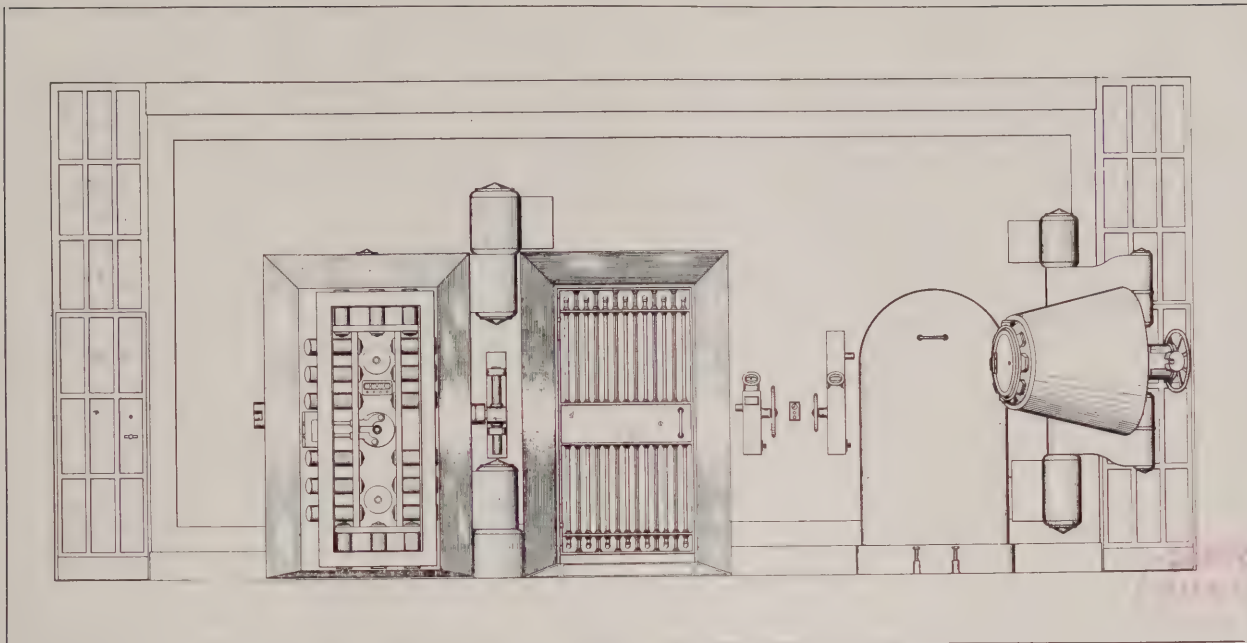
Ordinary reinforced concrete of itself can be cut by burglars' tools with what, to those accustomed to seeing its demolition in the usual manner, would seem amazing rapidity, the concrete being removed and reinforcements cut with either hammer and

chisel or the torch. It has been demonstrated that a manhole 2 feet in diameter can be cut through such a wall in less than two hours. The time consumed in cutting the hole is naturally dependent on the type and materials of the reinforcements and the number and skill of operators, as well as on the efficiency of the tools and torches they employ. Shock, tool and cutter torch resistance (and that involves not only resistance to the naked flame of the oxyacetylene torch but the fluxing rod and oxygen pipe combinations), is obtainable with linings and inter-linings which are available to all manufacturers through the use of several metals and materials. The shock resistance in this type of vault construction is provided partly by the inherent strength of the tool- and burner-resisting elements, and even more by plates of low steel, which tie and support them. A tool-resistant element commonly used is five-ply welded steel. The deep chilled outer face and diamond-like crystals of a special product, recently developed for the purpose, combine in a single plate both tool and cutter torch resistance. Metals of various kinds, both plain and in combination with copper and other metals, are being used, and though steels of all kinds are easily cut with the torch, simple cast iron has a degree of resistance such that, though simple perforation is not difficult, to cut a manhole is a tedious operation and can be done only by experts. Such materials constitute the lining, or it may be the inter-lining, the latter term being applied when there is an interior buttressing element or construction having on its inner face the usual open hearth steel plates.

The burglarious method of entering a vault with reinforced wall and steel lining is to take away a section of the concrete envelope, cut an opening manhole size through the lining, push the released disc into the vault, and climb in. With a drill-and-



Security Door, Closed

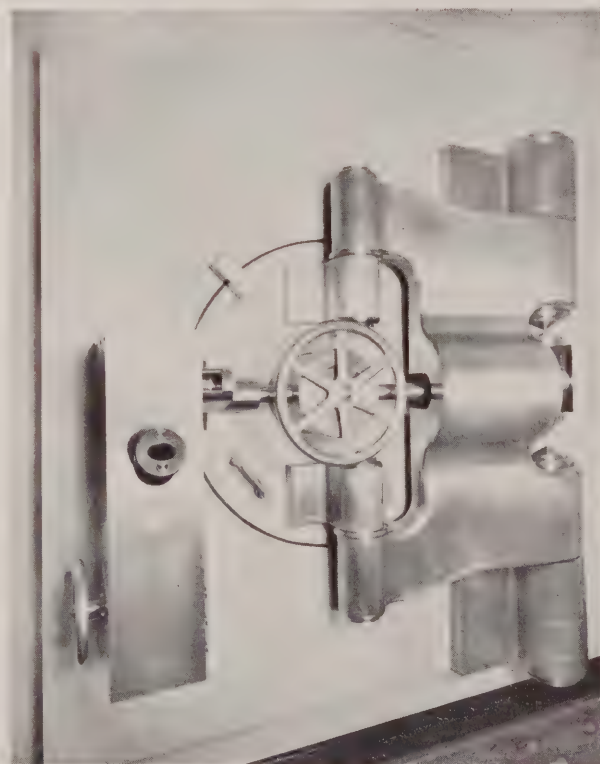


Vault Doors Open; Ventilating Hood Raised in Position

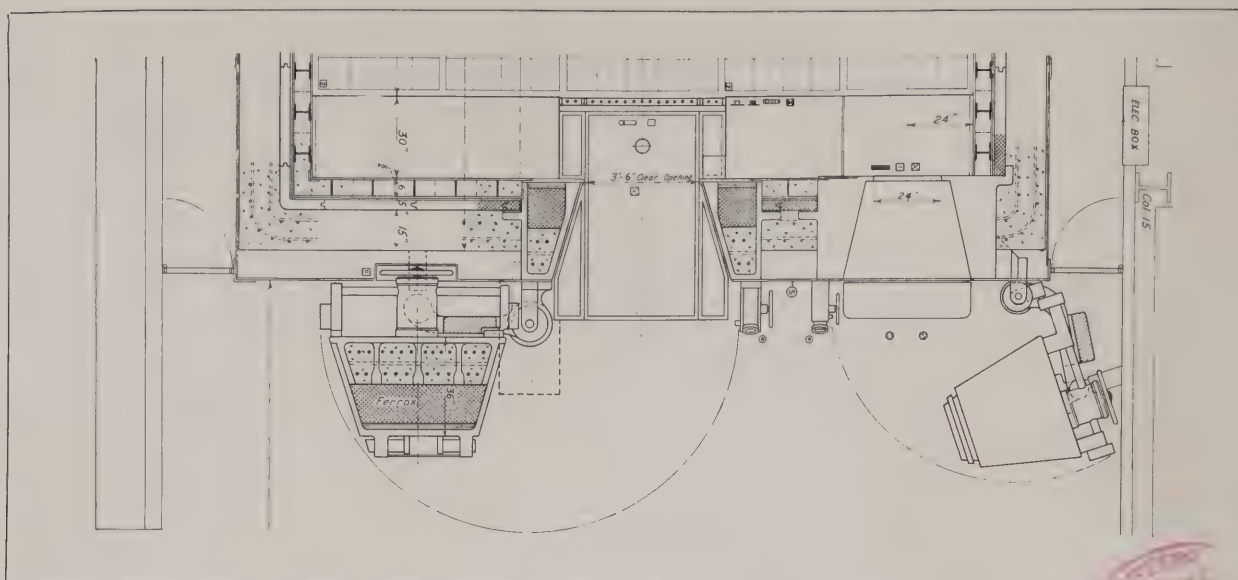
torch-resistant lining such an attack is made more difficult. But since there is constant development and counter development, and in view of the reasonable advances in attack technique that unquestionably will be made during the future lifetime of a vault, it is desirable to be somewhat ahead of the known present demands for adequate resistance. Therefore, in some vault walls there is the outer envelope of reinforced concrete, then the tool-and-torch-resistant inter-lining backed by a buttressing wall. With a buttressing element backing up such an inter-lining, even though some rapid means of cutting the latter should be devised, a cut-out disc could not be pushed in, and since the inter-lining is anchored at frequent intervals to the inside wall, the piece could not be pulled out but must be removed in small sections, requiring a long period of time. The buttressing wall, although of cheap construction, more than doubles the value of the inter-lining. One of the most economical and efficient designs is a series of H-beams closely bolted to the inside of the inter-lining, with intermediate rows of steel studs tapped into the inter-lining and steel inner-lining, which is also bolted to the inside flanges of the beams, the space between being solidly filled with concrete. It is best to consider the advisability of creating the greatest resistance time, so that the structure will be wholly beyond the "yegg" class.

Vault Doors and Locks. Door design follows rather closely that of the wall, with this difference,—that the door is a section of the wall with a joint, and must be treated with reference to the weakness of that joint. And there is another still more important difference, in that while the wall must be entered through a manhole, the door need have but a single small hole opposite the vital spot at the locking connections. Therefore, in the door, as compared to the wall, resistance to shock, tool, and

burner must be greatly increased without the necessity of increasing the fire resistance. If the doors are thin, the chances of successful burglary can be improved by increasing the simple perforation to handhole size, through which the connections may be easily reached and disrupted. If the door is measurably increased in thickness, so that the operator stands 2 feet, or even 3 feet or more away from the locking mechanism, the difficulties of entry are so increased that thick doors, aside from their ad-



Emergency Door, Closed



Section Plan; Security Vault of Buttressed Wall Design

vertising value, are warranted. They provide not only maximum resistance but cost comparatively little more than the thinner construction, because once given a set of hinges, pressure mechanism, bolt work, and locking devices, they can be made proportionately heavier and the door materially thickened at a comparatively small cost. The combination locks, locking devices, and the bolt-throwing mechanism may be transferred to the jamb, leaving the time lock on the door. In an attack this makes two penetrations necessary. Since there are always chances of failure with a single penetration where the locks are combined, these chances of failure are increased many times when the locking mechanisms are separated; and the attack-resistance time is more than doubled at slight additional cost. Ordinarily, the locking mechanism can be seen on the inner face of the door. With a balanced construction, where it takes as long to put a small hole through the door as to put a manhole through the wall, successful operation upon the locking mechanism through a small hole in the wall so unbalances the design as to reduce resistance-time values perhaps 90 per cent. A cure for this is to house the combination locking mechanism with heavy steel plates, so that it cannot be reached in such a manner.

Single doors, rather than outside and inside doors, have almost entirely superseded those of older design. The cost of second door hinges, pressure, bolting and locking mechanisms and the cost of the vestibule and the extra width and height of double-door construction made necessary to get a given clear opening, if put into a single door give many times the resistance value. The elimination of tongues and grooves and rebates at the edges of the doors and the substitution of a single machined surface constitute a marked advance in value and appearance of vault doors. These are referred to generally as "plug doors." The change has come about through a reali-

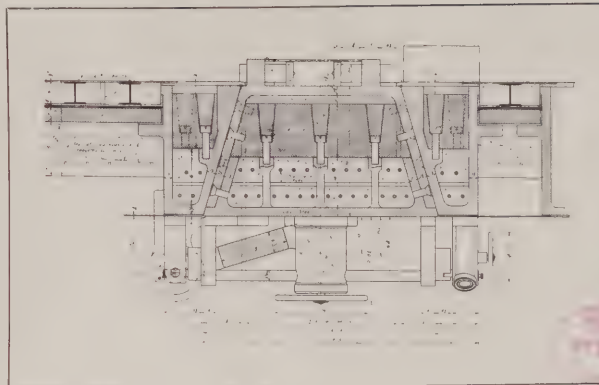
zation that every rebate is a reaction seat against which explosives may work to tear the door apart. This does not apply with as much force to modern heavy doors as to the thinner doors of laminated design. Furthermore, it is somewhat more expensive to make a door with steps, and the result is not nearly so impressive as the plain surface. Again, the plain step lends itself to a very low incline at the bottom of the door, some 3 or 4 inches in 3 or 4 feet, and this incline is so flat that the lowering platform of yesterday is not required except in the case of round doors, which are no longer the vogue.

Little change has come about recently in the design of time and combination locks. The time lock assumed its present state of mechanical simplicity several years ago, after having undergone a series of complicated changes. It now means only the winding of a time movement set for a given number of hours, at the expiration of which a dogging mechanism is automatically tripped and the boltwork released for unlocking. If these time movements were absolutely dependable, only one would be necessary. But they are not, and because time lock experts may not be available when a movement fails, the smallest number in use is two. To avoid the danger of a lockout because of the possible failure of the remaining movement, a third movement is common. Four movements are frequently employed to be well on the safe side of things. The combination lock has not changed in principle for 40 years, as it would seem that it had then been brought to practical perfection. Automatic bolt-throwing devices, in the form of springs or weights, have been abandoned, as once set they cannot be controlled to unlock the boltwork at the time determined. The now standard time lock goes off duty at the beginning of business hours, but the combinations still maintain the door in a locked position so long as may be desirable. A refinement of

recent years consists in the counter-balancing of the so-called foot bridge or foot plate which forms the runway through the entrance. As doors grew wider and thicker, these plates became difficult to operate until accurate counter-balancing at all points of their swing became a necessity. The emergency door is small, usually circular. It should be a counterpart of the main door in construction, and is always to be recommended. It not only permits immediate access to the vault in the event of a lockout of the main door, but affords means of ventilation, a subject that was almost wholly ignored in former years.

Ventilation has become recognized as one of the important features of vault design. It may be accomplished in several ways. The emergency door may open into a plenum chamber from which the air under pressure is forced through the opening, deflected to distributing conduits either at the ceiling or under the floor, liberated at the ends of the aisles to find its way through the vault and out the main door, where in the better class of installations it is picked up by a ceiling exhaust register; or, where the use of a plenum chamber is not practicable or desirable, a fan draws the air in through the emergency opening and effects the same interior distribution. Or else interior ductwork may be connected directly to an outside supply by a hinged conduit section which during the day is located against the top of the vault door opening. A combination of supply and exhaust ductwork has been used in some of the largest vaults. This type confines itself to the circulation of the air entirely within the vault. The need for ventilation rests largely upon the fact that a great number of heat units are liberated in the vault by the lighting system and must be taken out by forced draft, since a vault has no fenestration, and the air space is relatively small for the number of people using the vault.

Vault Equipment. The usual vault equipment needs no particular description here, but it is interesting to note that the use of stainless steel has in the last two or three years obtained wide favor, and that tens of thousands of safe deposit boxes, as well as many paneled steel ceilings, vault door finishing plates, and architraves, are being made of this material, which seems to be stainless in fact as well as in name. It is a trifle harder to work than low steel, and while the per pound cost is high, the elimination of upkeep costs may make it a good investment. Furthermore, its use does away with the otherwise necessary coating of anti-rust materials, usually in the form of oils and greases, which must be kept fresh to avoid rust and which frequently damage the clothing of box-renters. In recent years plate glass mirrors, located at the ends of transepts or aisles, have become popular by not only adding to the attractiveness of the interior finish but to a degree actually functioning as a protective element, in that all sides of a person standing in the aisle and facing the boxes can be observed by the custodian or who ever is in charge of the vault.



Horizontal Section of Door; Composite Construction

It is unfortunately true that often too little consideration is given to details of the design of safe deposit boxes. The subject fairly bristles with interest, not only as regards construction of the work, but also as to the business organization, policy and administration of the bank. The flat, uninteresting facade of a bank of safe deposit boxes gives little hint, to the uninitiated, of its real meaning. It is the curtain that hides a large proportion of the country's wealth, and conceals the things that spell comedy, drama and tragedy beyond belief. Frequently the whole of a man's possessions lies in his little tin slide behind a thin steel door, and it is often surprising to see what little thought is given to the make-up of this door.

The real crux of the material side of the safe deposit business, and its greatest danger, is in the key lock. One of the most famous lock makers of the world has said: "No lock having a key hole has ever been made or invented which is absolutely proof against picking, nor is it probable that one will ever be or can be made." Security is a relative term, and while no key lock is absolutely "pick-proof," some of them are so difficult to pick as to defy attack except by an expert aided by all favorable circumstances. This exactly describes present conditions, and while most modern safe deposit key locks are reasonably good, some are decidedly superior. As the security of the box depends upon the key, it would seem the part of wisdom to choose the best of locks. Practically all of the safe deposit locks being made today are of flat tumbler or lever type, some makers having as many as eight of these tumblers adjusted to a single key. Use of the preparatory or attendant's key is universal. Where the plain tumbler lock is used, the utmost protection should be given to the storage and handling of the keys before they are given to a box renter, because the honesty of the employes is the only guarantee against duplication of keys, and many robberies have been due to this cause. The so-called changeable key lock is undoubtedly the highest class safe deposit lock on the market today. This is a lock having adjustable levers which can be set to any selective key of its class. When a box is vacated by one tenant, these tumblers are returned to normal

position ready to be set to any other key. Meanwhile these keys are sealed in heavy paper envelopes, and a new renter selects his pair of keys by taking any package from the large number. In other words, the key he selects has never been seen by an employe of the bank.

As key locks are more or less readily forced from the door, and as "yeggs" have taken advantage of this fact, some devices have been placed on the market looking to reinforcing the lock and providing auxiliary bolts which spring into locked position when the lock is being forced. These devices, however, have not had a very wide application, except in outlying districts. Large boxes are frequently fitted with bolt work, and often have two locks, dial or key, providing double protection in addition to the custodian's check, and the dial or combination locks are fitted with supplementary key locks, the key being held by the custodian, to make sure that the box shall not be opened by the owner except in the presence of an attendant.

The importance of so small an item as the tin box should not be overlooked. Many of these are so weak in construction and so poorly finished that they should not be used. The tin, aside from the key, is the one part of the work that is handled by the box renter and should be rigid and nicely finished. The lid should be fastened with a high class latch or its equivalent. Small key locks, once in universal favor, are now seldom used. The high class tin box of today has so-called "runners" pressed outwardly from the bottom, the box taking bearing on two narrow lines instead of across the entire bottom, which resulted in collecting dirt and dust.

The electrical equipment of the modern vault includes high tension wiring for the general lighting system, which, if the vault is large, is thrown on and off by an automatic switch actuated by a remote control operated through a key lock, instead of by the usual button, to guard against the possibility of the vault's being thrown into darkness either accidentally or intentionally. Some large vaults carry an emergency low tension lighting system which functions immediately if the high tension power is cut off. In large security vaults power lines are run in to operate various machines. Constant, night-burning lights are installed in most of the recently constructed vaults. These are used to permit anyone locked in the vault, accidentally or otherwise, to read an instruction card, giving the home telephone numbers of bank officials and indicating a method by which he may unlock the time lock and wait for the officers to release him. People have been locked in even the smallest of vaults, both accidentally and intentionally, and a unit of this sort is always desirable.

While under normal conditions the average person lives comfortably upon 100 cubic feet of air per hour, the mental strain upon a locked-in victim has been considered so serious that auxiliary devices to lessen this hazard of mental strain are upon the

market. These have taken two forms,—one is the so-called breathing tube, which consists of a permanently installed tube, 3 or 4 inches in diameter, passing through the vault wall and fitted with a plug which can be removed from the inside of the vault. Some of these tubes carry small ventilating fans. Their practicability in extreme conditions has been questioned, and they should not be recommended in connection with the highest class of vault work. Tanks of oxygen with releasing valves and a chemical to be spread on the floor to absorb carbon dioxide have found some favor. Many vaults are equipped with closing alarm gongs, which ring at intervals during the time the vault doors are being closed and which are intended to act as a warning to any who may have remained unnoticed in the vault. As there is quite a list of accidental lock-ins, it would seem that consideration should be given to means of preventing them.

Electrical protection is somewhat outside the field of vault design, yet every security and safe deposit vault should be electrically protected. Often there is a question regarding the character of electrical protection to be used, whether central office or isolated alarm. This must be decided by conditions surrounding each installation. Sometimes it is answered by the adoption of both systems for a single vault, which of course provides double security.

Wherever practicable, a vault should be so located as to make possible arrangements for observation upon all six sides. Sometimes observation of the bottom can be effected only by setting the vault upon a series of low piers, spaced several feet apart, these spaces being observed through inclined mirrors located below glazed floor sections. This is the best safeguard against successful tunneling. Without these spaces even electrical protection is not always sufficient, because the circuits may be broken and such interruption interpreted as the result of grounding, corrosion, or the settling of foundations. Then all that could be done would be to cut out the damaged circuits and retain the remainder of the system, thus allowing a possible unprotected area for a tunnel. With observation there is always the resistance-time of the vault to be depended upon to carry between the rounds of the patrol, and more important still is the assurance, obtainable through it alone, that an interruption is not caused by a tunneling operation.

The entire subject of vault construction is so complicated and dependent on details, whether a large or small project be involved, that no attempt has been made here to cover it fully. A specification for a large vault and its equipment often covers several hundred pages. This may sound extravagant, but it is literally true. Moreover, such detailed description is essential to put vault bidding and building on the same basis of actual competition on a single definite design as is the case in general building construction. Without such detailed specifications, competitive bidding loses much of its value.

SECURITY VAULTS OF REINFORCED CONCRETE

BY

H. R. DOWSWELL

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PRIOR to 1920 the materials of security vault walls, unless they were of extreme thickness, were considered as being of secondary importance. In the smaller vaults brickwork was frequently employed, and occasionally concrete with a small percentage of steel reinforcing bars. The larger and more important vaults were in the majority of cases constructed of concrete heavily reinforced, but in all of them a steel lining was considered as offering the chief resistance to attack. This attitude toward steel linings was due to the position taken by the National Bureau of Casualty and Surety Underwriters, who in their Manual of Burglary, Theft and Robbery Insurance thus define a "Class 10 Vault," which is the highest classification they have established: "No. 10 Vault,—lined throughout with steel at least $1\frac{1}{2}$ inches thick, or with walls constructed of *non-reinforced* concrete or stone at least 54 inches thick, or of reinforced concrete or stone at least 27 inches thick."

Vault engineers and vault manufacturers accordingly concentrated their efforts on the development of linings. Until the advent of the burning torch, drills and explosives furnished the only means of attack. Consequently, vault linings were designed to resist drilling, since if a lining could not be drilled, explosives could not be effectively used. The development of the burning torch forced vault engineers and manufacturers to experiment with torch-resisting materials, since it was found that materials which were drill-proof offered little resistance to the torch. Unfortunately, torch-resisting materials can be drilled with comparative ease and are readily shattered by explosives. Linings were therefore developed, combining, in several layers, drill-resisting materials with others designed to resist burning. This practice called for thicker linings, resulting in increased cost in both materials and fabrication. This, briefly, was the condition in vault design when

the Federal Reserve Bank entered upon its extensive program of branch bank construction. Very little information of practical value was available, for although vault manufacturers had tested various lining combinations in their shops and laboratories, few, if any, extensive tests had been attempted under conditions such as would be encountered during burglarious or mob attack.

In 1920 the Federal Reserve Bank instituted a series of practical tests under the direction of Alexander B. Trowbridge, their consulting architect, in an effort to establish the relative resistance of all the known types of vault wall and lining construction and to rate these resistances in terms of cost. Tests can be made to show almost any result desired. The value of any test or series of tests, therefore, depends on the objective and the integrity and open-mindedness with which the tests are carried out. The Federal Reserve tests did not seek to discredit any material or method but merely intended to establish relative values. The test walls were constructed by a reputable contractor under careful supervision, while the linings were built and submitted by leading vault manufacturers.

It is the purpose of this article to discuss only wall construction, and consequently we are interested in the tests only insofar as they relate to walls. Concrete, consisting of carefully graded fine and coarse aggregates and fairly rich in cement, was found to offer considerable resistance to all three methods of attack,—drills, explosives and torch,—when steel reinforcement extended entirely through the walls and at right angles to direction of attack.

In order to study this type of wall further, it was decided to carry out additional tests and also to compare various types of reinforcement. A year later, 1921, a second series of walls were ready for testing. The concrete mixture in all of the second

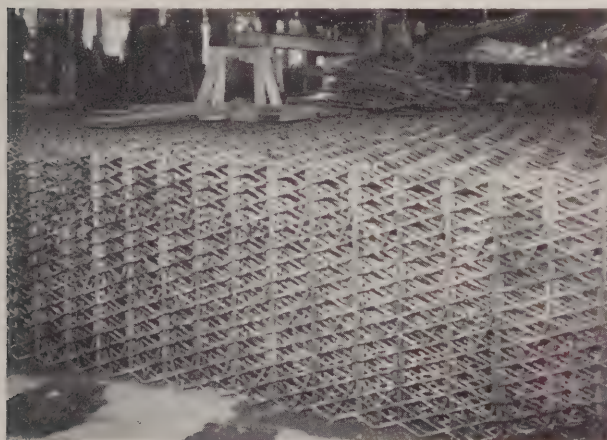


Fig. 1. Vault Floor Reinforcing on Edge, Spaced by Vertical Bars

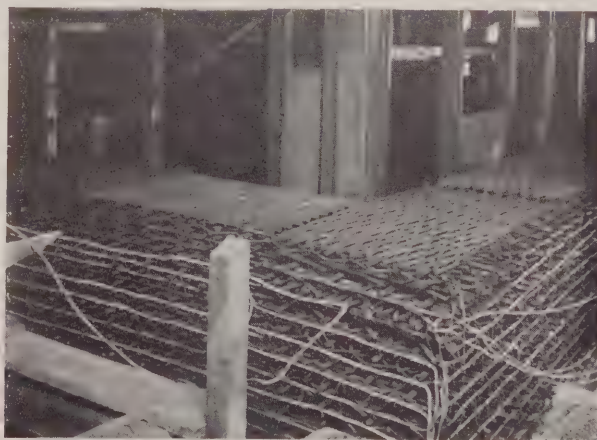


Fig. 2. Chisel-Resisting Bars Horizontal. Reinforcing Mesh Reversed in Each Layer



Fig. 3. Wall Reinforcing Placed on End. Bars Through the Meshes



Fig. 4. Reinforcing Frames of Bent Bars At Angles to Face of Wall

series was uniform, but the method of placing and the type of reinforcing varied, a special effort being made to try out materials which were available for use without the necessity of expensive fabrication. Two types of reinforcing, each of relatively low cost, were found to be very effective,—one, a heavy expanded metal, combined with a trussed bar; the second consisting of a series of frames formed of heavy steel bars which were united by smaller members.

A brief description of these two methods, together with a third and somewhat similar system which has since been developed, will, with the accompanying illustrations, show how far vault wall construction has progressed since the tests referred to were carried out. One of these materials consists of heavy steel plates expanded into a diamond mesh, —the diamonds measuring approximately 8 inches long by 3 inches wide. This mesh preferably is laid flat and extends horizontally through the wall to within about $1\frac{1}{2}$ inches of each wall face. On top of this trussed bars are laid at right angles to the wall face,—spaced approximately 8 inches apart,—with prongs formed by shearing portions of the flanges,

bent out from the main bar at an angle of about 45° . Similar construction is used for the vault floor and roof except that, to carry out the same theory, the sheets are placed on edge and the bars vertically. Fig. 1, which shows a portion of a vault floor mat 4 feet thick, illustrates this form of construction.

There are several variations from this type of construction, each of which adheres closely to the basic principles of the test walls. Fig. 2 shows $\frac{3}{4}$ -inch chisel-resisting bars laid lengthwise between the sheets and the mesh reversed in each layer. It should be mentioned that in both of these types $\frac{3}{4}$ -inch diameter rods are threaded through the meshes at approximately 1-foot centers. Fig. 3 indicates the sheets in the walls placed on end with rods threaded through the meshes. This type resulted from a demand for a cheaper wall, since it permits of a reduction in steel by using a wider spacing of the sheets. It is of course obvious that when the sheets are laid flat the spacing is determined by the diameter of the separating bars.

One company manufactures reinforcement consisting of horizontal and vertical type reinforcing. The

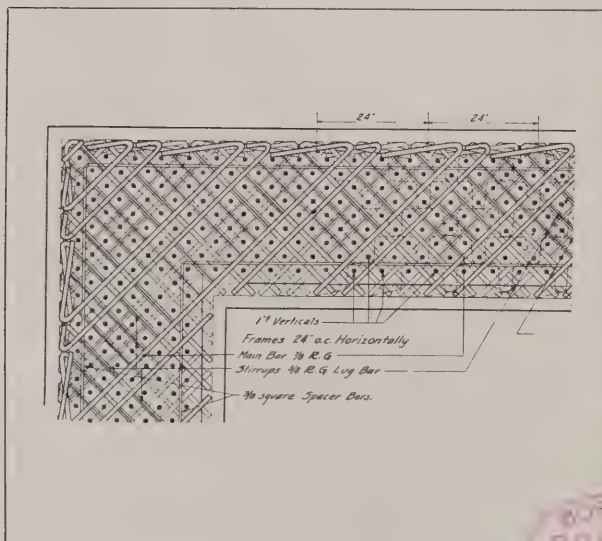


Fig. 5. Plan of Horizontal System of Bent Bar Frames with Verticals

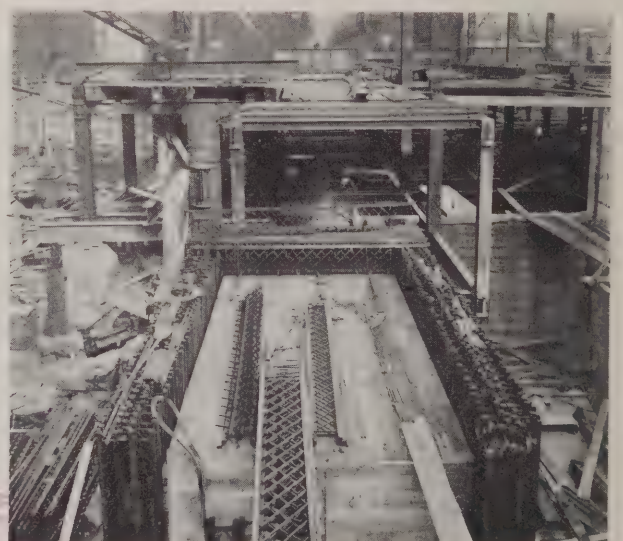


Fig. 6. Vault Under Construction, Showing Vertical Reinforcing

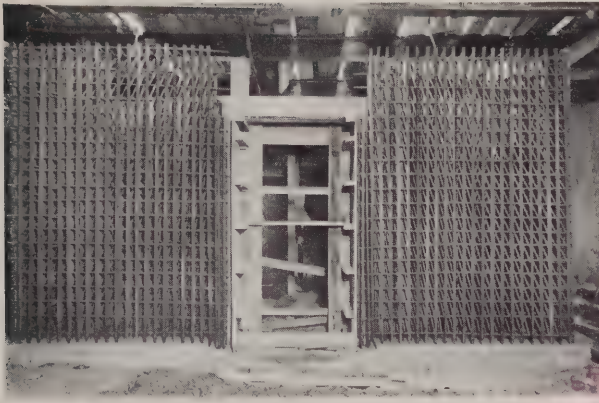


Fig. 7. Front View of Vertical Reinforcing

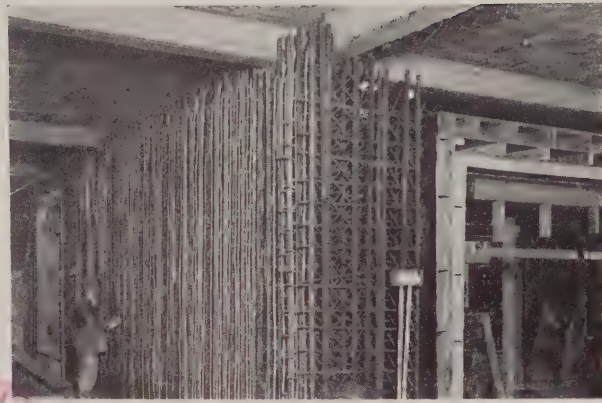


Fig. 8. Showing Placing of Electrical Protection Cables

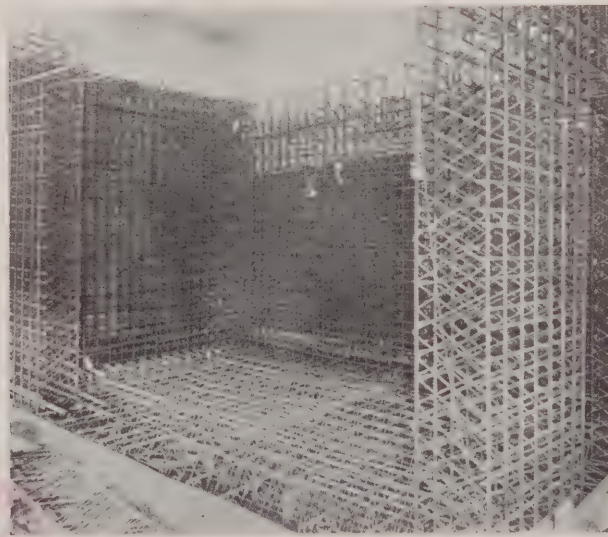
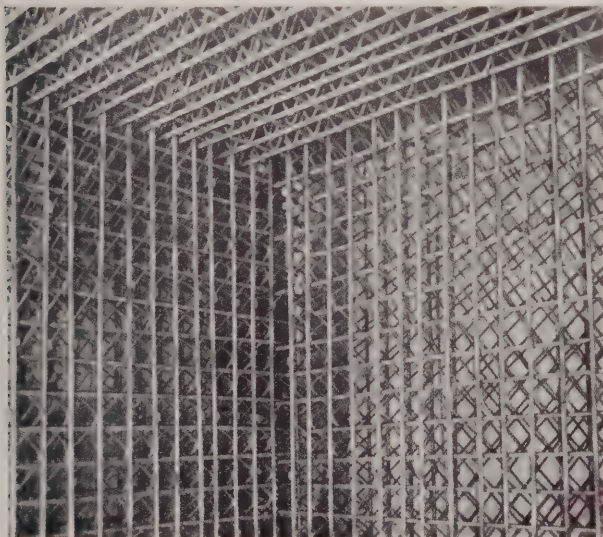
frames for the horizontal type are similar in appearance to sled runners and are laid flat in rows with the bent ends at the outside face of the wall. The axis of every frame is inclined at 45° to the face of the wall and the frames are at 90° to each other. Separators, parallel to the wall, are placed between adjacent rows of frames, and heavy bars are inserted vertically and threaded through the various members. Figs. 4 and 5 show a portion of this type of reinforcing. The vertical system manufactured by this company consists of three types of frames designed for heavy, medium and light construction. In all three types round bars are threaded through the diagonal members of the frames. Figs. 6, 7 and 8 show portions of vault walls under construction using this vertical reinforcing.

Within the last few years a third manufacturer, has entered the vault reinforcing field. This company employs a system of frames which is a modification of the bar joist. These frames are generally placed vertically in the walls but may be laid horizontally. Figs. 9 and 10 show two diagrams illustrating this system. In vaults using these types of reinforcing, the steel constitutes from 5 to 9 per cent of the cubic contents of the walls, floors and

roof, depending upon the spacing of the mesh, the size of the bars forming the frames, and the spacing of the frames.

The most satisfactory concrete mixture consists of one part of cement, one and one-half parts of sand, and three parts of broken stone or gravel, the stone being graded between the limits of a $\frac{1}{4}$ -inch and a $\frac{3}{4}$ -inch mesh. Experience has shown that in order to maintain a desirable water cement ratio, it is advisable to use an inert material in the mixture in order that the concrete may flow readily. When completely embedded in concrete, these types of construction result in a vault extremely difficult to penetrate, even if subjected to mob attack.

Figs. 2 and 8 show the usual placing of electrical protection cables. These cables are embedded in the outer face of the concrete and thus provide the first line of defense. In conclusion it should be mentioned that since the development of these reinforcing systems the National Bureau of Casualty and Surety Underwriters has given its No. 10 Classification to vaults without linings when constructed with walls, floor and roof 18 inches or more in thickness, reinforced with mesh or frames of the types shown, spaced at certain specified intervals.



Figs. 9 and 10. Reinforcing System Employing a Modification of the Bar Joist

DETERMINING THE BANK'S REQUIREMENTS

BY

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IN ORDER to start the drawings and specifications for a bank building of any type, it is of the greatest importance that the architect have a conference with the building committee and decide certain details. The architect is fortunate if he has a small building committee that will pass on these various matters and make prompt decisions. There are three things that come in the planning and designing of any building that it is well for the architect to make clear to his clients. They are, (1) the requirements of the building in regard to its size; (2) its cost and (3) the materials to be employed in its construction. The client can decide the first two, but he will have to leave it to the architect to tell him what the materials should be. To start the planning of a building in the most efficient manner, an architect should thoroughly familiarize himself with the type of the bank, trust company, savings bank, national bank or private banking company, its methods of doing business, number of accounts, etc.

A list of requirements and questions upon which the architect should have definite information and decisions should include:—

1. Number of officers who will occupy the officers' space on the main floor of the bank.
2. Number of committee rooms or private offices desired, with the approximate sizes of each.
3. Number of tellers and wickets.
4. Are tellers both paying and receiving, or are paying and receiving accounts separate?
5. Number of bookkeepers. Number of stenographers. If it is a large bank, the bookkeepers are usually placed on a floor apart from the main banking room, as there is considerable noise involved in their work with the adding machines. It is advisable to use some sound-absorbing material that will deaden the noise in the working quarters, and thus greatly increase the efficiency of the working staff.
6. Number of men employes and number of women employes, so that provision can be made for locker rooms and toilet facilities.
7. Safe deposit department requirements.
8. Sizes of vaults. In large banks it is considered the best practice to have a separate vault for the bank securities, aside from the safe deposit vault. In the security vault, the number of money chests and lockups required must be determined. In the safe deposit vault, the number of boxes of each size desired must be ascertained. These boxes will vary in size from 1 inch by 5 inches by 2 feet deep to practically a small safe. In obtaining information about the number of boxes, the banker should give the architect concise and accurate information as to the number, sizes and type of these boxes, and also the provisions which should be made for growth.

9. Number of coupon booths,—individual or double,—and the rooms of various sizes that can be used for corporations, payroll rooms, or for committees of public institutions, trustees of estates, etc. How many officers and attendants are in charge of this department?

10. Is a trunk storage vault for silver, etc. desired?

11. Should a vault for fur storage be provided? What type of temperature regulation is desired in the fur storage vault?

12. Are any dining room accommodations needed for the employes during noon hour? In some of the larger banks in the great cities, it has been found desirable to keep employes in the bank during the whole day. With that in view, some banks supply luncheon for their staffs.

13. Number of directors, so as to determine the size of the directors' room.

This list in a general way will give the preliminary information that is necessary for the architect in relation to the banker's idea as to the amount of money he wants to spend, the size and requirements of the building, and the material and equipment. The architect should request that the surveyor for the bank or superintendent obtain definite information for the architect's use. This is a questionnaire that this firm gives to the bank surveyor, requesting him to fill in the information on each question. This will save considerable time and greatly facilitate getting out the drawings.

Expansion. One of the most important items in the preliminary study of a bank is the question of future expansion. A bank should have the possibilities of 100 per cent expansion over its current needs. It is an absolute fact that the business of a bank will greatly increase when it gets into its new quarters, and it is a common occurrence at the end of ten years for a bank to need more than double the facilities it had at first.

Contracts. From practice it has been found that the best results are obtained by making three contracts for banking work, — one for the construction of the building itself; second for the interior equipment, which includes banking screens, finished floors in the banking room, electric protection for daylight hold-ups, bells, pneumatic tubes, etc.; and the third contract for the vaults and vault equipment. For the protection of the vault, the banker will probably have some definite ideas. The contract for the building should be let first. The contract for the vault second, and the interior equipment contract last. The chief reason for letting this equipment contract last is that it gives the architect and the banker time to study carefully the minute details.

ELECTRICAL PROTECTION FOR BANKS

BY

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A DOUBLE-HEADED question disturbs the ordered thoughts of almost every banker today: How can he keep the doors swung wide in public welcome, and still keep out the gunman? His contacts with customers, more personal than they have ever been, have stimulated competition among architects and the manufacturers of bank equipment to lower the counter screen,—approaching, as it were, without quite arriving at a form of cafeteria service so much desired by a less welcome visitor,—the bank bandit! That gradual elimination of barriers between the teller and depositor marks a changing status of the bank. Its use is no longer limited to a select circle of the financially well-to-do. Everybody is invited, even the successors of the late Jesse James. It is curious how men of the bandit breed occasionally acquire a halo instead of a noose, for rascality paraded under picturesque names is rascality still. Perhaps the popularity of a Jesse James is due to the fact that “he got away with it.” Had he fallen from his horse and started to run, we might hear less of a proposed statue to his memory. But shout “Stop thief!” and people will become a mob, a herd, with the jungle urge to hunt. A thug chased by a crowd knows that he had better throw his gun away, and thereby hangs our tale.

Styles change, even in thieving. A decade ago it was burglary; since the war, holdups have been the popular sport. The record of the past 20 years, according to the American Bankers Association, shows that bank burglaries outnumber holdups, although more is heard of the latter as they are more sensational,—more romantic! The banker gains nothing from report of a burglary, so there is no broadcast if he can prevent it. If he would consult his own interests, as others consult him, and listen to the insurance underwriters, the banker would learn that they say in unmistakable language that the problem of burglary protection resolves itself into two phases:

First,—prevention or interruption of an attack through prompt detection of the burglar's presence.

Second,—mechanical resistance to an attack.

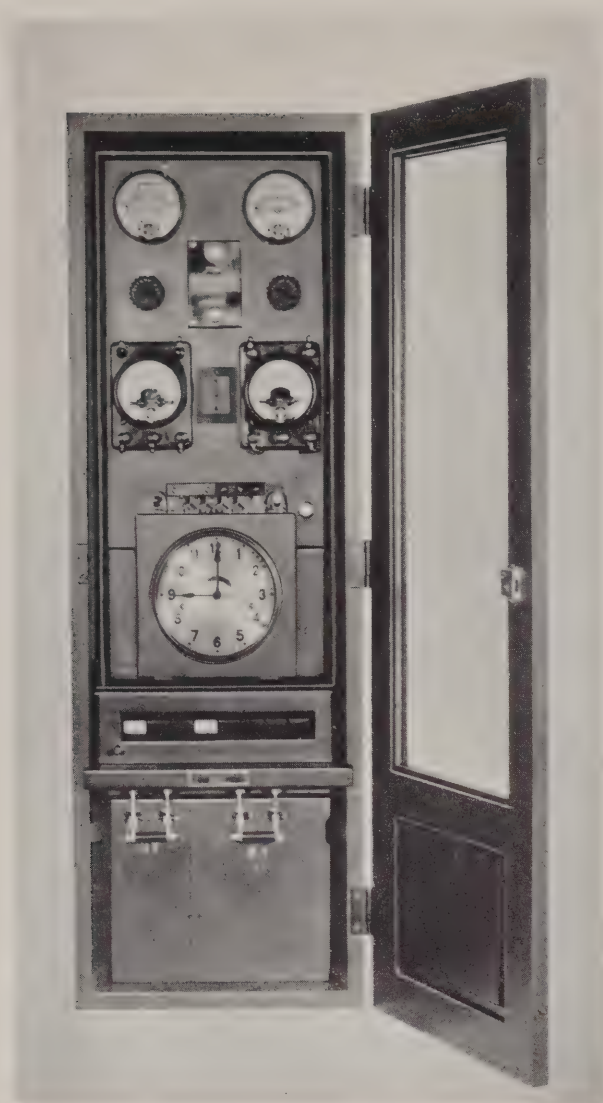
The first recommendation means only one thing,—good vault equipment. The heading of this article is its complement. In the two recommendations combined is an answer to the banker's question: How can I keep out the gunman and still throw the doors wide open to the public? We make that assertion without qualification and knowing full well that there are other forms of defense,—gas, turrets, bullet-proof shelters, sawed-off shotguns,—all dangerous playthings and a menace to the law-abiding as well as to the law-breaker.

Until the middle of the nineteenth century the locksmith had not developed his craft rapidly. The Egyptians had a lock with wooden tumblers, which

was clumsily imitated by the Romans. Mediæval goldsmiths relied mostly on bolts, bars and armed guards. One hundred years ago the key for a good strong-box lock weighed about a pound. A crime wave following the Civil War demonstrated that there was no such thing as an unpickable lock in this country. The combination lock was invented, and the burglar was surely beaten,—for maybe two years. Threats, backed up by the muzzle of a gun, or a charcoal brazier, forced the cashier to reveal the combination, and as the result of a demand for forms of defense not dependent upon human frailty, the time lock came into being, and with it came doors so well fitted that the joints were proof against the insertion of gunpowder. We of today laugh at those “well fitted” vault doors, and so did the yeggs of yesterday upon the advent of liquid explosives. The next defense was an automatic bolt-opening device, a self-controlled apparatus with all the mechanism on the inside of the door. The door itself was steadily improved in construction to resist attack from the newer and more powerful explosives. Then came the torch; and burglary was back on the front page. Weapons of attack and means of defense in this never-ending warfare remind one of the race in naval armaments; the Merrimac and Monitor, battleship and submarine, U-boat and depth-bomb. Methods of defense cannot remain static. The vault manufacturer and lock maker had contributed their best in the form of stronger and better built doors, in the development of torch-resisting and drill-resisting metal, in more cunningly constructed locks. Reinforced concrete had also taken more defensive shape. The lines were holding, but there were, and still are, hundreds of outlying banks without the wherewithal to buy new vault work. Those banks are in bad defensive shape against an attack from the gang,—organized crime; savagery with the weapons and equipment of science and the cunning wherewithal to use them.

Reinforcements came from an infant science. Electricity had cast off its swaddling clothes. Why, people might even use it for cooking; it would possibly supplant horse power as a means of transportation! Electricians sprang up in droves. Out of the ruck came the first burglar alarm. Bank robbery was a popular form of sport in the newer territories, and the first practical burglar alarm was a contribution from the open spaces, from the stamping ground of Deadwood Dick and his kind. The principle of that early alarm, more highly developed of course, forms the basis of most of the systems of electrical protection used today; that is, the surrounding of the vault with devices to surely cause an alarm in case of attempt at forcible entry.

Compared with present-day models, the early types



Typical Control Cabinet Showing Relays, Automatic Re-set Instrument, Timer, Indicator, Etc.

were in a class with the horseless carriage,—but they did the work. They were mysterious, there was no telling what it was all about, so the yeggs usually passed up the banks so protected and picked the soft banks. The original intention was to summon the police, but an attack on a bank in the earliest days of electrical protection gave a hint of a totally different effect. One winter night a gang of yeggs entered a bank in Nebraska, seized, gagged and bound the watchman, placing him in a chair thus trussed with a facetious invitation to “see how it was done.” What happened when they started to force the vault, is best described in the words of the watchman who was still tied up when found there next morning. “Say,” said he upon the removal of the gag, “when the alarm went off, them fellers never even stopped to say good-bye.” Overcoats, mittens and tools left in the flight backed up his statement; and nobody else in town had heard the alarm!

Two general types of electrical protection, both originally designed to summon the police, are in

use today: (1) the silent alarm; (2) the local alarm. The first warns the police by means of a line to headquarters, to a local police station, or to a central agency which sends its own armed riders and in turn relays the news of an alarm to the police. The second type sounds a loud alarm on the premises, inside and outside the building, so that everybody in the vicinity will hear it. Those two methods, in one form or another, are the basis of all the types of electrical protection listed in the Burglary Manual. The police alarm, or silent alarm, is perhaps peculiarly of value in states which are organizing *vigilantes*,—strong armed citizens, taught the use of sawed-off shotguns, who will spring to arms at a summons from the bank and work with the local police in rounding up the robbers.

Making the defeat of a burglary or a hold-up dependent upon the capture of the crooks looks like a tactical error to the writer, from the individual banker's point of view. As an auxiliary to the local alarm it is to be recommended, but we are reminded of that first turn at sentry duty when the sergeant quotes from the instruction book to report all suspicious circumstances to the corporal of the guard and adds out of his own experience: “Don't think you are the whole blankety army.” The fact that the bank was “protected” would, of course, reduce the possibility of attack.

When the local gong goes off, the whole neighborhood knows about it, and so do visitors, welcome or otherwise, even though it be a false alarm; and even though there be a dozen false alarms, the gong would still do its real work, for it is a curious fact that the virtue of the local alarm is no longer that of a police summons. Its continued use has brought to light that no burglar or hold-up man can stand for a single instant against the sound of an alarm. This would differentiate the “local” method from others as a reliance upon psychological reaction rather than upon physical action. The clang of the gong is the howl of the bogey man, the Cromagnon on the rampage, the drum call of the jungle that the hunt is on. Have you ever seen a close-up of the end of a man hunt? It is not a lovely sight. The hunted knows there is no pleasure in it—for him! Outside is the driver of the car with the engine running. Should he elect to save his skin, and if he has the immediate means, the jig is up for the others. They know it, and police records bear it out. Those inside gongs are intended to stimulate the racket outside, to make sure that the gangsters hear the alarm; and when they do hear it they are on their way; nor do they stand upon the order of their going.

Out of a number of attacks where abandoned attempts showed evidence of flight without any known alarm, we cite one that happened in an Iowa town. The cashier of the bank called the bank on the telephone, and, getting no answer, hurried down to find that a burglar gang had forced the door of the vault and had started on the safe, but had quit the attempt

and skipped. Nothing other than the ringing of the telephone had caused their precipitate flight. Electrical protection is the modern equivalent of the watch dog,—a sentry,—something that will give warning that marauders are afoot. It is not, however, a substitute for vault work, nor is it likely to take the form of live wires designed to give the thief a shock should he attempt to leave finger prints on the vault structure. That kind of thing is ruled out. An employe working overtime, the watchman on his nightly rounds, an industrious charwoman, would be the likely victim in any electrical equivalent of the mantrap or spring-gun. The gong on the outside of the building acts as a deterrent simply by its presence there, for the potential yeggs can see that the bank is "protected."

In highly specialized electrical equipment, there are, needless to say, many patented devices, but the working of an alarm system is nobody's secret. Out of what might be termed the "age of confusion" in burglar alarms, two types survived; in one type a grille work of cables was used, and in the other the protective feature was a "lining." In the cable type, lead-covered wires or cables are embedded in the masonry at the time the vault is built, tests being maintained continuously during their installation and also during the pouring of the concrete. The wires are set at approximately 3-inch centers and hooked up on different circuits, the number depending on the size of the vault, in such a manner that no two wires of the same circuit are adjacent to one another. In the event of a faulty circuit, the distance between live wires will never be more than 6 inches. Linings are installed either on the outside or the inside of the vault, the latter more adapted to existing structures, in the form of a special sensitive material described as an "open and closed circuit lining," which in turn is covered by light steel plates to protect it against any accidental penetration that would consequently cause a false alarm. Another form provides a grille work of closed-circuit wires protected by some form of envelope other than steel, such as plaster, or other fairly firm and protected materials. Those who have taken part in or supervised the cutting of hard concrete know that it means sledge hammer work or use of explosives. The forcing of a vault, therefore, without breaking cables or penetrating the lining, is not even probable.

There are two standard methods of protecting the door so that an alarm will sound in case of an attempt at a forced entry. One method is by applying heat-sensitive contacts to the inner surface of the door, which act upon the same principle as the sprinkler heads in a fire-protection system. A moderate degree of heat closes an open circuit in one or more of the contacts nearest the point of heat and sets off the alarm. Another method is to embed an "electrical lining" in the doors under either the outer or inner finish plate. This method requires the co-operation of the vault manufacturers and is standard practice, but is not practicable when the door is



Bank Teller Giving Alarm by Foot-Rail Contact

already in place. In both methods of door protection, alarm contacts are placed upon the door bolts to cause an alarm should the bolts be out of, or moved from, a locked position. In some cases additional protection is provided,—although not demanded by the underwriters, who are only concerned with forcible entry,—by placing contacts on the door locks. For doors of moderate thickness, the first method, the heat sensitive contacts, would appear to be preferable as least expensive, and for heavier doors the second method, the concealed lining, is recommended. A lining under the inner plate is not so good, since the attack would have to practically ruin the door to reach the lining. All the vault manufacturers are equipped to prepare their doors for electrical linings, and the additional expense involved in the purchase of new vault work is a comparatively small item.

The instruments used in the control of the system,—relays, timers, indicators,—are assembled in a cabinet, which is located for protection inside one of the vaults, preferably in the vault that, in accordance with the bank's established practice, is the last to be closed. Since an alarm system must be self-contained and self-protecting, it must also be self-controlled, as otherwise it could be turned "on" or "off" at will by anyone desiring admittance, whether it be the head of a gang or the head of the bank. There must also be some form of automatic control whereby the system will be disconnected from the night burglar alarm in the morning, switched on for day-raid



Setting Cables for Wall Protection, A, B and C Are Separate Circuits on Approximately 3-inch Centers

duty, then back again for the recognized hours of thievery. In some systems this is done by using a time lock similar to that used by the vault manufacturer for the time-control of door bolts. Bankers who have suffered damaged nerves as a result of a "lock-out" know that a timer which must be set every day is dependent upon a memory frequently harassed by financial problems. The "eight-day clock" as used by makers of one of the standard systems, the "continuous-running timer," as it is described, does not depend upon anybody's memory. It gives a "winding warning." Like the neglected young of the human species, it makes more noise yet, and keeps it up until somebody does pay attention!

How long does the alarm ring when it goes off? In the best systems, about 15 minutes. Some used to go all night, and maybe some still do so. If anybody in the neighborhood is not aroused by the din of a rapid-fire gong in that time, he is probably sleeping it off. One thing is certain: the yeggs would be off too. Suppose, however, that they had tripped the alarm with malice aforethought, one might ask, and returned to "pull the job" when the citizenry had retired and the police were on their third game of checkers,—what then? Well, if it were out of commission in the first place, the yeggs would not waste any further time on an experimental alarm. If they thought, further, they had put it out of business for the night by turning in a false alarm, they would be badly fooled provided it were equipped with an automatic resetting device. This feature is not demanded by the underwriters and it is a proof that some manufacturers have set a standard for themselves that will more than meet the requirements of the underwriters. The resetting device will stop the ringing of alarms (from any cause) at the end of a specified time,—from 15 to 20 minutes,—and automatically re-set the alarm system for another attack.

The latest development in burglar alarms, and one

that has only been perfected within the past few years, is the sound-sensitive alarm. It takes the place of cables and sensitive linings for the walls, floor and ceiling. The controls, door protection and alarm mechanism are practically the same as for the cable type. Sound-sensitive detectors,—the size of the vault determines the number,—are fastened to the walls or ceilings like so many wasps' nests. They are, in effect, microphones. There is nothing new about the theory of the sound wave. Cry "boo" when you see a grasshopper feeling the air with his antennæ, and watch him jump. Do the same in a vault equipped with a sound-sensitive system, and the indicator will dance with joy. Wait till the alarm is turned off, however, before making such a test. That such a system must be fool-proof, super-efficient as it were, is self-evident. In actual commercial use over a period of years, it appears to be completely successful. It has a special appeal for the architect and builder in that its installation, aside from a few runs of conduit, can be deferred until most of the other sub-contractors are out of the way. The noises of an attack on the vault structure are caught by the "mikes" and the disturbance, stepped up, is relayed to the gong. The "mikes" are also sensitive to the snapping of torches and other vibrations produced by an attack on the vault doors, although not affected,—at least not enough to cause an alarm,—by vibrations originating outside the vault from street cars, trucks, machinery and things of that kind.

The banker and his architect, having in mind the purchase of vault equipment, will hear much talk of the Underwriters' Laboratories, of "Class No. 10 Vault Construction," and of "Grade A Electrical Protection," therefore a few words of description. The Underwriters' Laboratories is an organization maintained by the underwriters of insurance to serve as a central testing station where products designed to prevent fire, theft, robbery and burglary or to protect property in general, can be investigated and their merits ascertained. The classifications for vault construction were not determined by laboratory tests but grew out of what was considered good practice,—in the days before the invention of the cutting torch. Class No. 10 is the highest standard of vault construction recognized by insurance companies and one which entitles the owner to the maximum discount based on physical equipment, or, as they term it, "mechanical defense." It is exemplified by the vault having 18-inch reinforced concrete walls, a steel lining half an inch thick, and the standard 10-inch door. Neither heavier and better looking doors nor stronger walls get a better rate,—yet. Grade A is the highest form of electrical protection recognized by the underwriters of insurance and entitles the owner to a 65 per cent discount on any rate for burglary insurance based on physical protection, even that for a Class No. 10 vault. It was established by tests at the Underwriters' Laboratories. It would appear, then, that the people who insure against burglary must think fairly well of electrical protection. They make this distinction between

physical protection and electrical protection, however. A 10-inch door built 20 years ago is still in Class No. 10, whether the builder is still in business or not. Manufacturers of electrical alarm systems must pay a yearly fee for each model approved, to keep it approved. If the manufacturer goes out of business and no similar concern takes over the responsibilities and care of his models, they come off the list of approved systems, and the 65 per cent comes off the list of approved discounts. Before asking for bids for his client, the architect will be well advised to consult the "Who's Who" of burglar alarm manufacturers.

Specifications for electrical protection can of necessity merely outline the general requirements of a system to be selected, one that has been developed by the manufacturer and passed by the Underwriters' Laboratories. Any arbitrary demands in the specifications might mean trouble over insurance premiums and would certainly be an invitation to argue as well as to bid. A comparison of the relative merits of the various systems is something else, and should be a determining factor in the awarding of a contract. Some systems just "get by" the underwriters, and others provide a scope of protection much in excess of those standards. The essentials of a system of electrical protection against burglary and holdup are outlined in these paragraphs.

1. The purpose of that part of the system of electrical protection embracing defense against burglary is that an alarm will sound or be turned in automatically under any of these or similar conditions:

(a) An attack on the vault walls, ceiling, floor slab or door by torch, drill, explosives or other burglarious means.

(b) An attempt to open the vault door at other than regular working hours or in a regular manner.

(c) Any attempt to cut the wires forming a part of the installation,—the lead to the gong for example.

(d) Any tampering with the alarm gong, if it be a local alarm.

2. In the event of a holdup, the alarm is set in motion by manual contacts—push-buttons, or by some variation of that process; a foot-rail, for example.

3. In electrical protection for a night depository, there is no choice of type; the cable system is used.

After the awarding of the contract, the work will, for the greater part, be covered by the specification head "Coöperation with Other Trades." The manufacturer should be kept informed of the progress of the building operation in order that he have his material on the site in time. This is generally done in two parts, viz.,

(a) Cables, conduit and other concealed parts which are installed early.

(b) Visible equipment,—controls, push-buttons, alarm gongs,—which are installed shortly before the keys are turned over to the owner.

Experience dictates that the conduits should be furnished and installed by the owner, that is, that

they be included in the electrical contract. It would eventually come around to him, however it were handled, and it is standardized material.

There is one item of burglar alarm equipment that the architect cannot blink at, and that is the location of the alarm gong. It is enclosed in a heavy steel housing, emblazoned on the front with the legend "Burglar Alarm," pierced with louvres to let out the sound, and so anchored to the wall that only an explosion would dislodge it. How the architect loves signs, clocks, or bird houses of any kind plastered on "his" building! That gong housing on the outside of the building for example,—let's stick it around in the alley or back of the parapet where it won't be seen. It can't be done. One of the unalterable,—the architect might call it "unutterable,"—commands of the underwriters is that the gong housing be so located that he who runs may read the inscription "Burglar Alarm," and that nothing be done to blanket the sound of the gong. Furthermore, they specify that the gong be placed from 15 to 25 feet above the sidewalk. They have unbent so far recently as to decree that an alarm housing may be recessed, provided that such will not muffle the sound of an alarm and provided further that any grille in front of the gong housing may readily be removed or opened for an inspection of the housing and its contents "without difficulty" by the Laboratories' representative or by factory inspectors. The architect must make up his mind early in the development of his elevations that the gong or other alarm housing will appear somewhere on one of the main elevations. If he leaves it to a mechanic who thinks in terms of burglar alarms and not of architectural orders, there is no doubt that it will meet the requirements of the underwriters,—but how!

In calling for bids, and before awarding the contract, the experienced architect will ask in effect: "Who are you, and what have you? Is your system sold outright, or is it rented?" If the work be included in the general contract, as is sometimes done even for the vault itself, the contractor will more than likely buy "for a price," and the difference in price between the best alarm equipment and something that will just get by, is a matter of a few hundred dollars at the most. Bearing in mind that the protective value provided by a first class complete alarm system is so much greater per dollar of cost than is afforded by any other protective measure, the price is of relatively less importance than is the type of system, the quality of the equipment, the nature of service to be rendered, or the standing of the manufacturer. The approval of the Underwriters' Laboratories is, of course, essential on account of the large discounts allowed for an approved system. The best systems, however, provide a scope of protection in excess of those demanded by the underwriters who are concerned only with a forcible entry. In a chart representing bank losses from all causes, including burglary and robbery, that sector colored to indicate embezzlement and "inside jobs" makes

quite a splash. There is also the factor of carelessness. Few householders have not, at some time or other, left their doors unlocked, and the same thing happens in the best regulated banks as to vault doors.

The most complete local alarm system with which the writer is familiar effectively guards against the leaving of the vault unlocked overnight and also protects the combinations and time locks from disloyal tampering. The central station type also provides means of detecting and correcting such conditions, involving again, however, a dependence upon human fallibility which is the occasion of the condition in the first place. The humble watch dog is introduced as a form of insurance policy. Hire a man to do that kind of work, and the premium for burglary or robbery insurance is immediately discounted. An article of this kind would be incomplete without some data about insurance rates for burglary and for robbery. They represent the insurance companies' reaction to bank defenses.

Here are some culls from the Manual of Burglary, Theft and Robbery Insurance:

1. The basic rate per thousand for burglary on that old time "insulated" cupboard painted black and labeled "Safe," is\$25.00
2. In "Class No. 10 Vaults" this rate comes down to 2.00
3. For watchman service there is a discount of 10%
4. Territorial discount.

(a) Some states are statistically more law-abiding than others, or at least less open to attack. In Maine and Maryland the territorial discount is 40%

(b) In Illinois and Oklahoma, where there is apparently an open season for bandits, the discount is nil

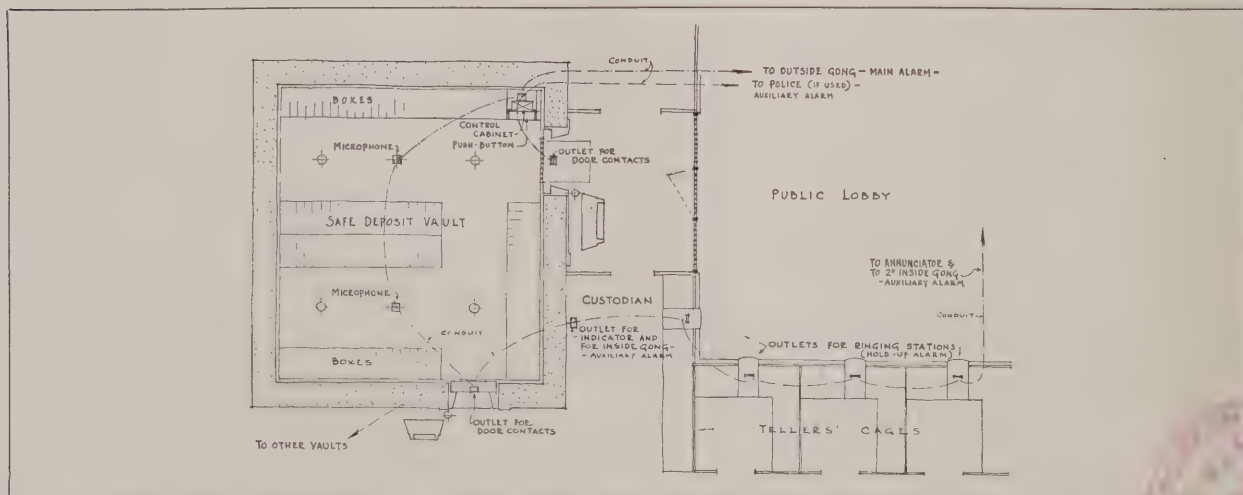
(c) Parts west, taking in Hollywood, get .. 20%

5. Population discounts vary; as the birth rate rises the insurance rate comes down, regardless of locality. That seems to let out the natives and bears out the claim that New York gunmen do all the Chicago robbing and vice versa.

6. Then comes the discount for electrical protection which, for a Grade A System, regardless of locality or strength of vault, is 65%

Robbery is something else. The best the insurance people will do, even with police guards and holdup alarm, is a 20 per cent discount. There is less at stake, however, in actual cash loss from hold-up than from burglary. The stock newspaper statement to the effect that the robbers scooped five thousand in the cages and missed fifty thousand in the vaults does not make the thugs feel badly. They got what they were after,—all the cash in sight,—and they got it while one might hold his breath. The only thing that could keep an organized gang out of a bank during working hours is a cordon of police or a regiment of soldiers. If things should come to such a pass, the securities in the bank would hardly be worth the paper they were printed on. The banker must do his business out in the open in this day and age and, in so doing, must necessarily take some chances as he does every time he steps off the curb. By exercising reasonable caution in crossing the street he may keep his name out of the papers, and by doing the same thing with his bank he may keep the name of his bank off the casualty list.

In the exercise of reasonable precautions the architect should unhesitatingly recommend that his client keep in mind not only the insurance standards for good vault work, but the advertising as well of the potential defense of a heavy door supplemented by a complete burglar alarm system, one with adequate ringing stations to provide alarm in case of holdup; that the alarm system should be selected only after careful investigation and be of a type providing the largest possible scope of protective service rather than one that merely meets the limited requirements of the underwriters, a system furnished by a well known and reliable concern that offers a genuine inspection service. Thus equipped he may invite all his friends to the bank with reasonable expectations that no unwelcome visitors will try to crash the gate.



Plan Showing Conduits and Outlets for a Sound-Wave Alarm System. Hold-Up Alarm Is Operated by Foot-Rails in Tellers' Cages

THE HEATING AND VENTILATING OF BANKS

BY

PERRY WEST

CONSULTING HEATING AND VENTILATING ENGINEER

THE banking building presents a variety of problems for both the architect and the mechanical engineer, not only on account of the diversity of the departments to be provided for and the different uses to which the spaces are to be put, but also on account of the different characters and proportions of the areas to be treated. In the smaller bank we usually have the relatively large main banking room, with its high ceiling and large cubic contents per occupant, and in conjunction with this the cages and officers' rooms, which are less spacious and more densely occupied. The working spaces for bookkeepers and stenographers are sometimes located on mezzanines or galleries around the walls, over the cages. Such working spaces may also be provided adjacent to the main banking room, in basements, or on floors above. There is usually a board room, either with or without committee rooms, sometimes located on the gallery, sometimes in the rear, and sometimes on an upper floor. Toilets are provided for men and women, accessible to the several departments and, in modern practice, with rest and recreation rooms adjacent. Vaults are of course a necessary adjunct to any bank. In larger banks, cafeterias and dining rooms with kitchens, for the working staffs and officers, are frequently added. The working spaces are frequently separated from the main banking room and located in adjacent rooms or in other stories of the building, thus eliminating the galleries in this room. In still larger banks the officers' rooms or spaces are separated from the main rooms and located adjacent to them or on other floors. In addition, such buildings may include concessional spaces for stores, restaurants, luncheon clubs, auditoriums, etc. The building may be extremely high, with elevator shafts and stairs to act as flues for producing drafts and otherwise distributing the proper operation of the heating and ventilating apparatus. The kind of sash to be used, whether double-hung or of some form of casement or ventilating sash, steel or wood, weatherstripped or plain, also has a bearing upon the designing of the heating and ventilating apparatus.

In connection with all of the problems which these various conditions impose upon the proper selection and designing of the heating and ventilating equipment, the first and most important consideration is that the architect should have a thorough understanding with his equipment designer as to the exact requirements to be met, the uses to which the various parts of the building are to be put, and the space requirements for the equipment, the ducts, the pipes, radiators, etc., before the design has prog-

ressed beyond the sketch stage. The importance of this can scarcely be overestimated in face of the fact that a recent survey has shown that the heating and ventilating, (especially the ventilating,) in most of our banking buildings are not functioning properly because these requirements were not so worked out, and because the equipment was installed with an attempt to meet building conditions that did not allow the proper functioning of this equipment. The matter of first cost is frequently allowed to interfere with the selection and designing of the proper apparatus, but if our past experiences are to be of value to us in this connection, I should say that after viewing so many examples of improper ventilating, it would have been much better to omit the apparatus altogether and save its cost rather than to install a defective system, which would be soon shut down and allowed to stand as an idle investment. In many cases investigated, much simpler and less expensive systems were installed later to act in place of the systems which did not function, but it stands to reason that the proper kind of a system can be better and more cheaply installed at the time the building is erected.

On the whole, I think we may say that the heating of banking buildings, as it is practiced today, is fairly satisfactory, but that the ventilation is generally poor. The combination of the two is generally faulty, causing drafty, over-heated and otherwise poorly conditioned atmosphere, principally because the specific requirements are not properly worked out between the architect and his equipment designer, and also because the designer is not allowed enough funds for either his equipment or its study and design. There is perhaps a broader field for the improvement of the heating and ventilating equipment of this class of building than in those of many others with which we deal.

Heating. The heating may be by steam, hot water or furnace, and the fuel may be coal, oil or gas. With steam or hot water, the heating may be by direct radiation or partially or wholly by indirect or hot blast methods. If the building is purely for daytime banking purposes, steam with direct radiation is perhaps the best, as it will keep the walls warm long after heat is shut down and will tend to offset their cooling effect quickly after it is started up. Working spaces, board rooms, committee rooms and other such spaces as are likely to be used at times when the main banking room is not in use, may be piped on separate systems, or be equipped with auxiliary gas, electric or domestic hot water heating, so that heat may be shut off of the main banking



Upward System of Ventilation, Fresh Air Supply Behind Tellers' Cages

room at such times. Radiators for the main room should be under windows, generally in recesses with grilles in front and over the tops. The newer types of concealed fin radiators are adaptable to this arrangement. Vestibules should be well heated and provided with revolving doors to prevent an influx of cold air, especially in tall buildings. Skylights should be protected with enough radiation to prevent sweating and the dropping down of cold air on the heads of people below. The main room should be under automatic temperature control. While temperature control is desirable elsewhere, and while it generally saves an appreciable percentage of the cost of fuel, it may be omitted, excepting in the main room.

Vaults generally do not require heat, except in special cases where employes are continually on duty and where heat may be necessary to dispel chill and dampness. Warm air or electrical heat is usually employed. The cages where clerks are on duty continually should be well heated and arranged with automatic or good hand control. Spaces around the public desks and in coupon rooms, reception rooms, and other public spaces which patrons enter directly from the outside should be especially well heated, preferably under automatic control. Board rooms,

committee rooms, officers' rooms, toilets, rest rooms, recreation rooms, dining rooms and work rooms should be well heated, and with the exception of work rooms and private offices, they should be under automatic control. It should be remembered, in connection with the heating of all purely banking spaces, that the occupants are generally sitting, at very light work, and that with the nervous energy expended and the thin clothing worn, especially by the female employes, a comparatively warm and draft-free atmosphere is required.

In the cheaper class of buildings a one-pipe steam system may suffice, but banking buildings are generally of a character to warrant a two-pipe vapor or vacuum-heating system. Any bank structure of appreciable size had best be equipped with a vacuum system, since the requirements for quick and positive circulation are pronounced in this type of building. Care should be exercised to properly balance the system, so that none of the vital parts of the building, such as the cages, working spaces, officers' quarters, board rooms or private offices, are on ends of long runs, remote from the boiler, where the steam will be lost first and regained last as the pressure is dropped and raised on the boilers.

Boilers for small buildings may be of cast iron or steel; for larger buildings steel is most used, and for buildings where great capacity is required in small floor space, water-tube boilers may well be installed. Where a private electric generating plant is to be used, the boilers should be high-pressure, to operate at from 100- to 150-pound pressure, and the heating system should be operated on exhaust steam with a vacuum return system and automatic live steam made up through pressure-reducing valves. Generally speaking, a private plant is not a paying investment when the electric current can be purchased for 2 cents or less per kilowatt hour. Run of mine soft coal or fine anthracite at \$6 per ton is 20 per cent cheaper than heavy fuel oil at 5 cents per gallon for the larger plants, and larger size coal at \$12 per ton is 20 per cent cheaper than furnace oil at 10 cents per gallon for the smaller plants, not considering any savings in costs of coal and ash handling, which in many instances are greatly in favor of oil burning. The cost to install stokers for coal burning or oil equipment for oil burning will run from 25 per cent to 50 per cent of the cost of the boilers, depending upon the size of the plant, and stokers should save from 10 to 15 per cent of the coal over good hand firing. Coal and the lighter fuel oils (28 to 32 Be) are adaptable to full automatic control of the fire from a thermostat in the main banking room, and this relatively simple and cheap form of temperature control may be very successfully used for the smaller institutions. The heavier fuel oils (14 to 16 Be) are not adaptable to full automatic control and are best used where a competent operator is on duty at all times.

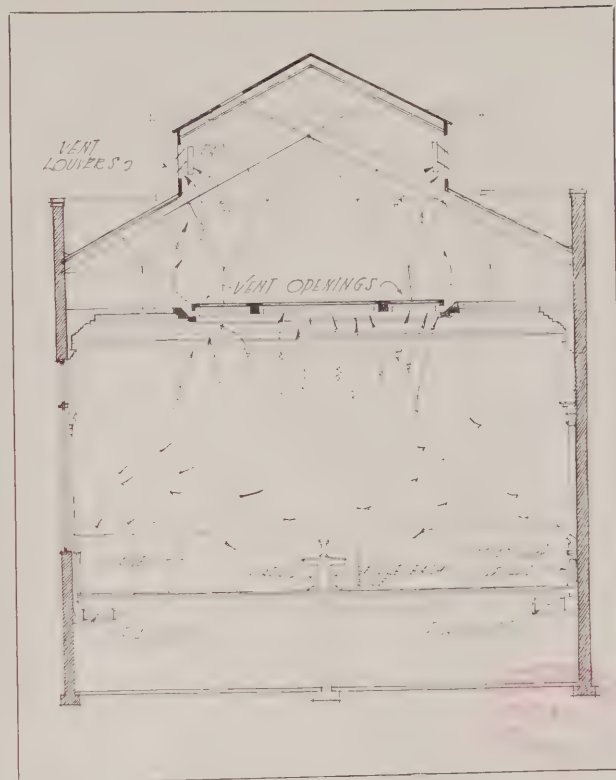
Hot Water Heating. This type of heating is not especially adapted to banking buildings unless it is

to be operated fairly continuously, since the large spaces and massive construction constitute too much inertia to be readily overcome by the slow action of hot water. It is easily adapted to simple and inexpensive temperature control, and when properly designed and operated gives good and economical results as compared with a steam system for heating over the same periods of time. Its first cost is substantially the same as for two-pipe vapor or vacuum steam without temperature control, and somewhat cheaper when the water system is operated from one central automatic temperature control as compared with full individual automatic temperature control for a steam system. Hot water is not so well adapted to buildings over five stories high, on account of excessive pressures on the radiators unless the system is divided into vertical sections.

Furnace Heating. Without fan circulation this form of heating is not suitable except for small banks, but with fan circulation it may be extended to a moderate sized building. It has the advantages of low first cost, combining heating with ventilation, quick response, and the elimination of radiation. Care should be exercised to avoid a type of construction that may leak dust or gases from the furnace into the rooms, and also to get a type with automatic humidifying apparatus for preventing excessive dryness in the overheated air, especially near warm air inlets. Furnace heating is not especially efficacious in warming up the cold walls of large rooms, and it is susceptible to disarrangement in operation by wind and by the chimney effect of the building.

Indirect or Hot Blast Heating. This has substantially the same advantages and disadvantages as furnace heating, except that the hazards from gas are eliminated, the dust nuisance is not so great, and the conditions of the air may be more fully controlled.

Ventilation. The ventilation of the main banking rooms in small banks has not, until quite recently, received much attention, except to depend on the windows and doors. It has been found, however, that with the increasing dust and automobile smoke of the outside air, especially in the larger cities, this method is quite destructive to books and records and that a great saving is effected by the use of artificial ventilation and air cleaners. The spaces in and around the cages, the mezzanines, galleries, coupon booths and any other small rooms are the only areas within the main banking room which generally require ventilation, except in the larger institutions. One problem, however, is how to introduce and remove enough air from these spaces without creating drafts. Another problem, which becomes increasingly difficult of solution as the sizes of the rooms increase, is that the inside temperature is considerably lower than the outside temperature in summer, so that the air introduced is not only disagreeably warmer, but becomes cooled and therefore more humid, frequently to the extent of depositing moisture or preventing the evaporation of perspiration, thus causing papers and books to feel sticky, blot

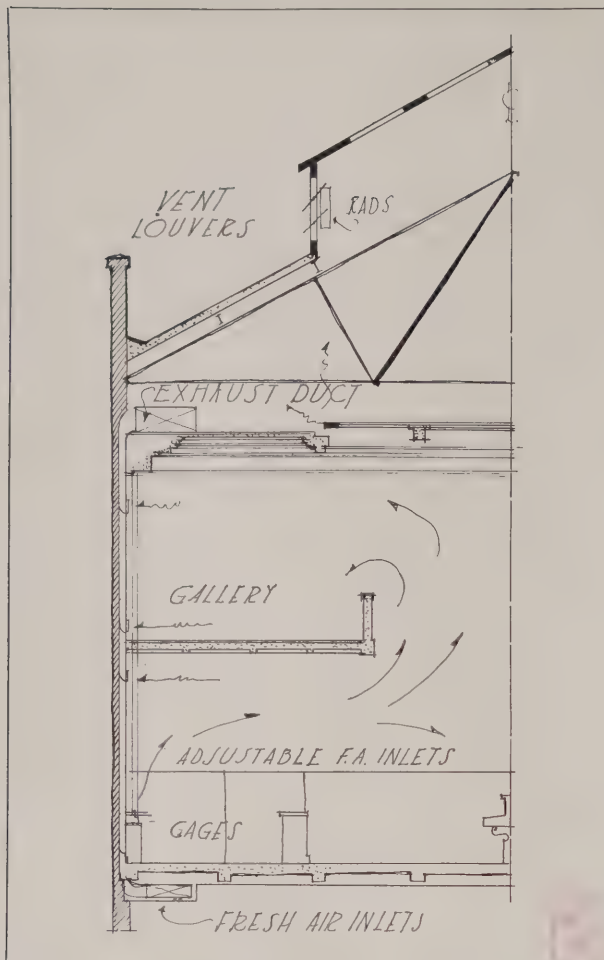


Upward Ventilation and Direct Steam Heating System for Large Bank

and become soiled. The only proper solution of the latter problem lies in the use of refrigerating and dehumidifying apparatus for decreasing the moisture contents of the air to a point considerably below the dew point of the inside air, and then in reheating this air, even in summer, to a point not more than 5° Fahr. below the inside temperature, in order to prevent drafts. This process is expensive and requires heat even in summer, but it should be carefully considered before going ahead with any other kind of a ventilating system for the main banking room.

In cases where the size of the room or the character of the work does not warrant this treatment, the air may be first passed through filters, thence through automatically controlled heaters, and then to the spaces to be ventilated. It should be delivered well above the heads of the occupants, and for cages it should be directed upward and outward at an angle so as to prevent drafts. Where possible, it is advisable to bring this air in along the window sills, directed upward for winter (so as to meet and diffuse with the down-falling cold air), and outward for summer so as to afford air movement for cooling. Adjustable outlets are preferable in any case, so that the angle of the air stream may be varied to suit conditions and even directed outward and downward for summer cooling.

Where there are no mezzanines over cages, the foul air may be exhausted through skylights in the main ceiling, either by mechanical or natural means, or through grilles and flues where no skylights are



Upward System of Supply and Exhaust Ventilation in Banking Room with Gallery

available. Where mezzanines exist, a portion of the foul air should be exhausted from the rear of the cages near the floor so as to establish a local circulation, while the greater portion may be exhausted from around the walls of the galleries near the ceilings, so as to afford a circulation for these. It is also well, in connection with both the exhaust from the cages and from the galleries, to have both bottom and top grilles provided with adjustable louvers so that the air may be removed from near the floor, from near the ceiling, or both, as required.

Coupon booths and other small rooms, without windows, within the main banking room should be provided with separate systems of exhaust ventilation and have louvered doors for admitting air from the main room. Where this kind of ventilation is inadequate, the best solution is to treat the entire main banking room as a unit; introduce tempered air in winter and dehumidified and cooled air in the summer through a multiplicity of grilles with proper diffusers in the ceiling, and remove the foul air through grilles around the walls near the floor. Separate exhaust systems should be provided for coupon booths and other small rooms as was just explained. Conditioned air should also be supplied through the ceilings under any galleries over cages, and foul air should

be exhausted from near the floor around the walls of any galleries. This kind of a system is sometimes designed to operate as an upward system by introducing the air around the walls, from under seats and platforms, and through window sills and jambs, the foul air being removed through grilles in the main ceiling and in the ceilings under galleries; but it is invariably found that this is a difficult system to handle without creating objectionable drafts. The principle of upward ventilation appeals on first thought as being the natural and easier method, especially for summer, but inasmuch as the air must frequently be cooler than the room in winter to prevent overheating, and should be cooler than the room in summer to prevent sweating, the introduction of the air at the floor usually causes complaints of drafts. If the air can be introduced upward through window sills and ledges around the walls, with adjustable outlets, the conditioned air method may be used as described for the raw air method, but on the whole the downward system is usually preferable. Remote push-button control of the ventilation for cages and small room systems is advisable in order that attendants may easily adjust the ventilation to suit conditions.

Toilet Room Ventilation. This should be entirely separate from the remaining ventilation and may be by gravity or mechanical exhaust with louvered doors for admitting air from adjacent spaces. Where obtaining a natural supply is not feasible, an artificial supply of cleaned and tempered air should be employed, but care should be exercised to have the supply less than the exhaust. Remote push-button control with interlocking arrangements, so that supply fans cannot be run without exhaust fans, is advisable for toilets. Ventilation for toilets should provide from 12 to 20 air changes per hour.

Rest and Recreation Room Ventilation. This should be separate and similar to that for toilet room ventilation, except that the supply and exhaust may be about balanced and interlocking control features omitted. About six air changes per hour should be provided.

Ventilation of Working Spaces. This is variously treated according to the density of occupancy, nature of work, kind of employees, i. e.,—men, women, boys or girls, available funds, and character of the space. These general rules can be laid down:

1. Each floor or section of floor, or in some cases two or three floors (wherein the same kinds of activities are housed under the same management), should be provided with a separate system. This applies particularly to supply systems, but may with best results be extended to exhaust systems, although many floors of the same institution may be connected to the same exhaust system. The ventilation of working spaces should not be combined with other ventilation, nor should separate and dissimilar departments be combined, especially where they are under separate managements, since their requirements and ideas are different. The most satisfaction is given when

each department has control over its own ventilation, especially over the air supply. The ventilation of these spaces, or of other parts of the banking company's quarters, should not be combined with the ventilation of rentable portions of the building.

2. Air supply should be from side outlets near the ceilings, preferably with adjustable outlets for directing the air current upward or downward. The exhaust, if employed, should be from side outlets near floors and ceilings, with adjustable louvers so as to exhaust from either or both points.

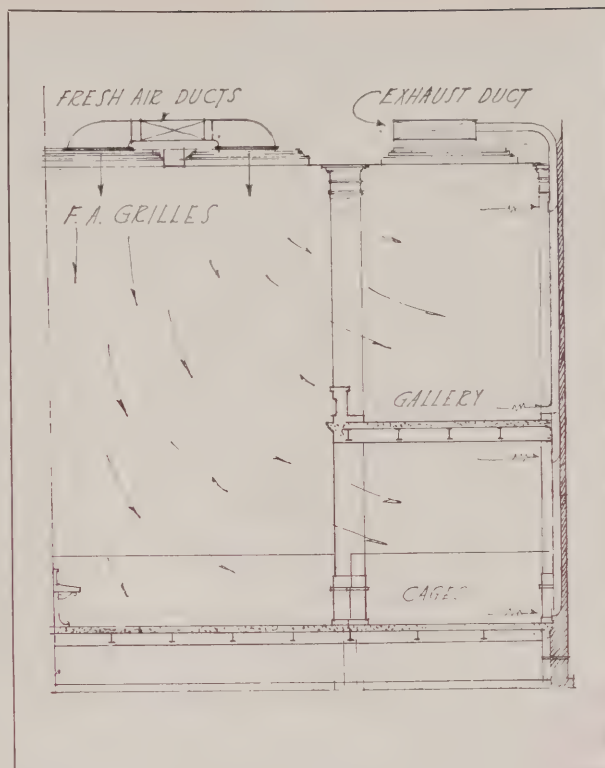
3. In basements there should be an exhaust as well as a supply system for removing the excessive heat in summer. On upper floors the exhaust system may be omitted, and skylights, ventilators or even the natural leakage through windows and doors be used, but in the better class of closely occupied spaces a mechanical exhaust system, or at least an adequate gravity system, should be employed.

4. The air supply should be filtered and automatically tempered, and to cut down operating expenses a recirculation system may be employed. The recirculated air is introduced from the rooms at a point just ahead of the heaters, so as to deliver the air to them at a temperature of about 50° Fahr. by mixing the recirculated air with the fresh air. This should operate under automatic control from a thermostat just ahead of the heaters, which would automatically deliver 100 per cent of fresh air at 50° and above,—and would recirculate more air as the temperature outside falls, up to about two-thirds of the total quantity at 0° Fahr. outside.

5. The air supply may range anywhere from 10 to 30 cubic feet per person per minute and from .5 to 1.5 cubic feet per minute per square foot of floor space, with an exhaust of from 80 to 90 per cent of these amounts.

Ventilation of Board and Committee Rooms. This should be separate exhaust ventilation, affording about 15 to 20 air changes per hour. Where feasible the air supply may be taken from the main banking room, but otherwise there should be a supply from the outside. The air supply should be filtered and automatically tempered, and the apparatus should be separate from other systems. The apparatus should be under remote push-button control from the respective rooms.

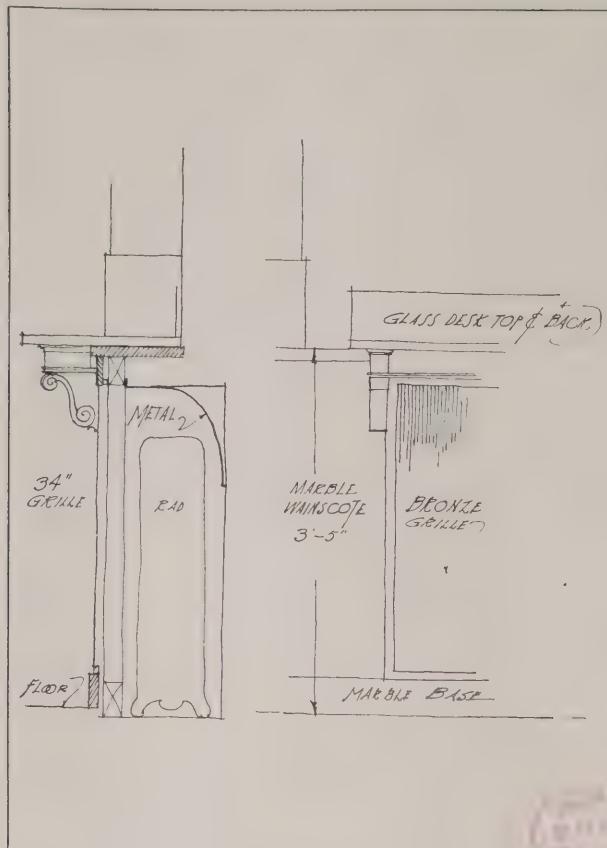
Kitchen and Dining Room Ventilation. This should be by separate exhaust ventilation from the kitchen, with hoods over ranges, kettles, urns and bake ovens, affording about 20 air changes per hour. The dining rooms may be very successfully ventilated by exhausting into the kitchen, but an adequate automatically tempered and filtered air supply should be furnished for the dining rooms with side inlets near the ceiling or vertically through the window sills. Exhaust may also be taken from the dining room to supplement the exhaust through the kitchen, but ample flow should be maintained from the dining room toward the kitchen, in order to keep the kitchen odors from reaching the dining rooms and other



Half-Section Showing Downward System of Cooled and Humidified Air and Exhaust

parts of the building. The foul air from kitchen and dining rooms should be discharged above the roof and in such locations as not to be objectionable in adjacent quarters or where it might be drawn into fresh air intakes. The kitchen exhaust should be taken up separately in a heavy iron or masonry flue with automatic fire damper, automatic bypass around fans, and with steam jet fire-extinguishers, since vapors frequently collect and take fire in kitchen flues.

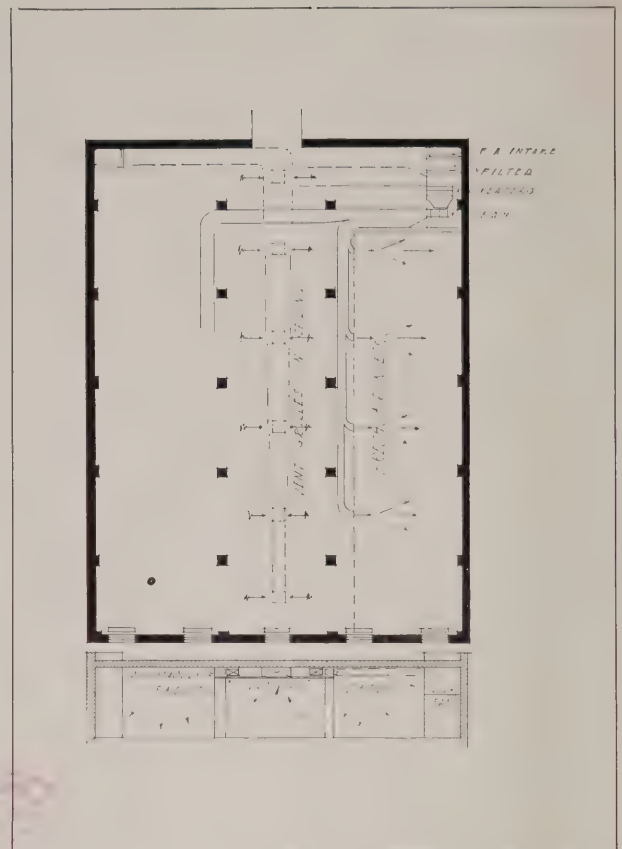
Ventilation of Machinery Spaces. Boilers and engine rooms entirely below grade should be supplied with filtered and tempered fresh air, although it is not necessary to provide for as much heating of the air as is generally required for other spaces, since the heat from the apparatus and piping will usually suffice. From four to six air changes per hour are usually sufficient, except in cases of congested equipment where much heat is given off. Exhaust systems are required where such heat is to be removed or where odors from machinery might otherwise escape to the upper floors. Such exhaust should be by mechanical means unless dependable gravity methods may be provided through flues around the outside of the chimney or through other flues of sufficient height to overcome the vagaries of the wind and weather. Care must be exercised to see that the boiler draft is not interfered with, either by the removal of too much air from the boiler room and adjacent spaces or by the lack of fresh air supply by either natural or artificial means. The removal of air from the boiler room is likely to cause



Sketch of a Type of Concealed Radiator Under Check Desk

back drafts, and the carrying of flue gases out into the rooms. All foul air from machinery rooms should be carried to a point above the roof and discharged so as not to cause a nuisance to surrounding quarters or be drawn back into any fresh air intake. Air conditioning may be necessary in certain instances of shut-in, congested spaces, but special care must be taken to prevent drafts where this is employed.

Generally. Fresh air intakes should be from points two or three floors above grade or sufficiently high to prevent the intake of dust and dirt. If air is taken from the roof, intakes should be from points removed from chimneys, exhaust outlets, and other contaminating influences. Air filters should be of the metal constructed type and either automatically self-cleaning or provided with convenient equipment for cleaning and reconditioning. Main exhaust dampers should be provided with remote control for operation from convenient points, or with automatic control for closing when the systems are not in operation, and for opening when they are, so as to conserve heat and prevent back drafts. Each fresh air inlet or foul air outlet should be provided with a louver, damper or deflector, as required, so that each individual opening may be properly adjusted. Fresh air inlets should be provided with metal roll type or other convenient shutters for closing off when not in use, and both fresh air inlets and foul air outlets should be provided with wire mesh bird



A Simple System of Ventilation for Office or Work Space

guards. All ventilators, hoods, bird guards and other metalwork above the roof should be of copper or other rust-resisting material. Stair and elevator enclosures, especially in tall buildings, should be provided with tight or revolving doors to overcome the chimney effects of these shafts on the air movements.

Unit Ventilation. Ventilating units may be employed to advantage in many departments, where more elaborate systems are not procurable, and they lend themselves very well to use in cages, working spaces, board rooms, etc. They have one particular advantage favorable to satisfactory results as far as the occupants of such spaces are concerned, and that is that they may be locally controlled to suit those within the immediate vicinity. They should be enclosed or built within recesses, with adequate provisions for fresh air supply from a clean source and be provided with individual or centralized filters. The foul air may be removed by the methods described for other types of supply systems.

Some recent developments in the use of concealed heaters with tempered air supply from a plenum fan system, so dampered that part of the air can be so supplied and part recirculated from the room, would indicate that these may also be used to advantage for the less elaborate systems. Adjustable dampers are used so that any portion of the air supply may be from the plenum system, and arrangements are also such that the air so supplied acts on an ejector principle to accentuate the recirculation from the room.

WHAT THE BANKER EXPECTS OF HIS ARCHITECT

BY

C. STANLEY TAYLOR

A LARGE proportion of average individual business success may be attributed to the capacity for appreciating the other person's side of a business problem. Many of the troubles which are encountered in business relationships could be more readily smoothed out if the capacity for understanding the other man's point of view were more uniformly distributed among business and professional men. Nowhere is this fact more definitely obvious than it is in the architectural profession today. Disappointments on the part of clients in most cases originate in a lack of mutual understanding.

It is quite refreshing to take up a problem deliberately from the opposite point of view and to learn, from an analysis so made, some of the workings of the client's mind, and thus establish factors which will result in a more satisfactory conclusion of the business contact. In this article it is our purpose to discuss the architect's relationship with banker clients by endeavoring to analyze what the banker expects of the architect whom he has engaged to design a new structure or to alter and improve existing banking quarters. From such an analysis we may develop a basis upon which the architect may carry to completion a bank building project with the utmost satisfaction to both himself and his client.

When a banking organization plans to build, it is confronted with essentially the same problems that are present in any building operation of an investment nature. To these are added a few highly specialized problems centered around protective systems, vaults, and arrangement of space which will result in the most efficient conducting of the bank's business. In spite of the fact that bankers are often looked upon as the sources of money for building operations, they must give as careful consideration to their own expenditures as do firms in other lines of business. When a bank builds, the economic aspects of the investment must be analyzed from every point of view or the bank will be involved in an expenditure greater than its income warrants, or will be possessed of an inefficient structure. Even though bankers devote their attention exclusively to financial matters, they are not as a rule acquainted with the details of financing and other economics of building operations. They properly look to their architects for facts which will enable them to analyze the cost of their new building, the maintenance cost, and in some instances the income which may be derived through the rental of the space not used by the bank itself. This aspect of the situation is sometimes overlooked by architects who fail to appreciate the fact that bankers devoting themselves to corporate securities and governmental matters rather than to mortgages and loans on real estate, may be just as much in need of guidance in the development

of their own projects as a home-builder or the head of an organization without building experience.

The first problem the banker must solve is the determination of the type of building in which to house his institution. He may elect to build a structure solely for banking purposes, in which case he desires a more or less monumental building of no great size, all of the space of which is to be devoted to the requirements of his own business. The other type of bank structure provides banking quarters in combination with rentable space in the form of either stores or offices. The latter type is designed to produce a certain amount of income which may be applied toward reducing or eliminating the carrying charges accompanying the investment in land and building. Bankers are still struggling with the problem of choosing between these two types of structures. They seek buildings which will express their strength, integrity and responsibility, and the wealth of their organizations. They have been accustomed for many years to the creation of monumental buildings of architectural beauty and great dignity. Possibly each has taken a certain amount of personal pride in having a building which is superior to those of his competitors. On the other hand, bankers have found the burden of these buildings to be very real. Their maintenance cost has constituted a drain upon the banks' resources and profits, and the gradual depreciation of the value of the structures has been another element of cost which they have frequently been unable to justify as attributable to the advertising value of the buildings.

Banks in large cities, such as New York, Chicago, Philadelphia and elsewhere, have had forced upon them the necessity for combining income-producing space with their banking quarters, in order to offset the very excessive rent cost in the congested areas where their bank buildings must be located. They have frequently accepted this requirement and have created buildings of greater size in which the banking quarters take a relatively small percentage of the space. Since smaller banks look to these larger organizations for precedents, not only in their banking operations but in their methods of doing business and housing their organizations, there has come to be a fairly general acceptance in smaller communities of the idea of combining banks with income-producing space. Probably the trend will continue in this direction, for, after all, no intelligent banker can on the one hand advise his customers against extravagant expenditures for business buildings and industrial plants and on the other hand erect "banking monuments" which do not pay for themselves. An illustration of this occurred recently in Philadelphia, where one of the well established banks purchased a site and informed the

architect that a 10-story bank and office building was desired. The architect, apparently having more than the usual business acumen, immediately inquired as to the reason for a 10-story building. The bankers' rather surprised response was that the added space was to reduce the cost of carrying their building. The architect took it upon himself to make a careful analysis of the cost of the property and of the proposed structure, including the usual operating costs and the gross income to be expected from the office space to be thrown on the market. He found that a 10-story building would almost carry the investment, but would leave no margin for its amortization. A little further study showed that a 14-story building would not only take care of all carrying charges on the investment, including depreciation, but would amortize the cost of the building in 20 years and give the bank its quarters free of all expense. Upon reporting these findings to his banker clients, they adopted his suggestions and displayed a great deal of confidence in the architect's judgment on all the other business matters which developed during the course of the operation.

After the type of building has been established, the space requirements for conducting the bank's business must be established through a careful study of the actual working methods of the bank. The banker conceives of this problem in two ways. He probably has a fairly fixed idea as to the size of the public space and a fair knowledge of the amount of working space necessary to take care of his employees and the bank's working space and equipment. The banker does not always analyze this problem in terms of cost, but he very soon finds that this aspect requires attention. He expects his architect to work these general ideas as to the size and layout of his public and working spaces into a structure which will fall within a cost figure which has been at least roughly determined upon. Bankers have accepted the necessity for combining their quarters with income-producing space with much grace. They have nevertheless retained a strong and well founded desire for creating an imposing display of strength, wealth and high position both within their quarters and throughout the buildings they own.

It is undoubtedly necessary that banking quarters create an atmosphere of permanence and dignity through consistent architectural character. The use of the finest materials and the soundest methods of construction is imperative. Nothing can be more disastrous than evidence of false economy through structural cheapness or the failure of building materials or finish. The architect is expected to utilize his designing talents to create a masterpiece of architecture and at the same time to exercise his business acumen and ingenuity to the end that the bank may be well housed at reasonable cost. In both these basic requirements, the banker looks to his architect for a knowledge of protective systems, vaults, bank equipment, and the organization of the bank's work to the end that the space may be so arranged as to

reduce to a minimum the time and labor required in the daily work. Much depends upon the architect's cleverness in planning a layout to afford the greatest security to cashiers, tellers and clerks during banking hours and to form an invisible but impregnable line of defense against intrusion after the bank is closed. Perhaps the most important phase of this problem is the designing of vaults. The banker is beginning to appreciate that securing economical vault construction is an important problem and that it is one in which the architect can play an important part. The Federal Reserve Board, prior to the development of Federal Reserve Bank buildings in some 20 cities throughout the country, appropriated \$120,000 for special research into the construction of vault walls and linings. This work was carried out under the direction of Alexander B. Trowbridge, who was consulting architect for the Federal Reserve Board, and resulted in the construction of experimental vault walls of many types, which were subsequently penetrated under time tests. As a result of this research, many millions of dollars were saved in the erection of the Federal Reserve Bank buildings throughout the United States.

One matter which the banker usually places wholly in the architect's hands is the provision of adequate space to take care of the business which is anticipated. Large banks have many thousands of accounts and have widely adopted the system of classifying the accounts alphabetically or numerically, with a teller assigned to each division. This requires a multiplicity of tellers' cages and involves unusual liberality in the public space to provide for the many customers who must be accommodated at once. Congestion in public space is exceedingly dangerous. There must be ample room at all times to afford the guards an opportunity for close supervision of all persons, even during the rush closing hours and during the times there is extra business which comes when payrolls are being prepared.

The banker has a right to expect that the architect, knowing approximately the amount of money available for his new building, shall proceed to draw up sketch plans which are not exaggerated and which come fairly within the given appropriation. It is utterly illogical to provide sketch plans which obviously cannot be built for the desired cost and which must result in the forming of unfavorable opinions on the part of bank directors when this fact is ultimately determined, and it is always far better to face facts in the beginning. The banker expects to give his architect the data for the functional plan. No one knows his individual business as well as he; no one can forecast its growth as well. His architect may wisely call the banker's attention to the value of elasticity in plan, to the anticipation of growth, to modern planning ideas which have been successful elsewhere, but he must at the same time appreciate the effects of local conditions and methods of doing business. What is good for a bank in one city or town may not of necessity apply in another instance.

SPECIFICATIONS FOR BANK BUILDINGS

BY

LEWIS W. FOSTER

OF THOMAS M. JAMES COMPANY, ARCHITECTS

SPECIFICATIONS for bank buildings have the same fundamental principles as those for any other type of structures. The better these principles are known, the better specifications will be written. The specifications determine the success of a building project to a greater extent than any other document, and they affect every person interested in the project. The responsibilities of the specification writer are, therefore, many and varied. They may become a source of pleasure and satisfaction to the man who writes them, or they may be decidedly irksome. Incidentally, they may be the direct cause of the failure of a project, or of the architect. The responsibilities of the writers of specifications for bank buildings are as great as those placed upon the writers of specifications for other types of buildings. The kinds of materials and the quality of materials and workmanship vary greatly; probably the quality is higher in bank buildings than in other commercial structures. Any one type of building naturally has its particular features which are not common to other types. This possibly applies in a greater degree to bank structures than to most other types of buildings, since few others require as much special equipment,—such as the bank counter screen, the security vaults, the various protective devices, and particular kinds of furniture and equipment. The hospital, of course, requires the most exacting and varied equipment and detailing.

The specifications for a bank building (and this applies to other particular types of buildings in varying degrees) offer an excellent opportunity for standardization. By this we mean the use of standard sections of the specifications, standard paragraphs or standard sentences, descriptive of some particular material, method, or class of workmanship. The use of standard subdivisions of the general specification will save the architect considerable time, but they should be used with the greatest of care. This will be considered in greater detail in later paragraphs of this article. The success of any building project is probably due more to the proper spirit of coöperation between those interested than to any other one thing. The writer of specifications must ever bear this in mind, and should at all times take particular care to foster this feeling throughout his specification and to demand that it be the guiding factor in the actual construction work; otherwise the proper coördination of the work of the various trades will not result. Without this spirit of coöperation no building project can be considered a complete success.

We must assume that the writer of specifications for bank buildings is experienced and qualified. All will have their own theories and systems as their aid

in completing a proper specification and for use as a reminder and check upon their work. There are certain fundamentals which go to make up a good specification for a bank building. Some of the more important principles, if emphasized here, will serve to call them again to mind. Without a complete knowledge of the basic principles, the specification writer is very likely to lose sight of them in constructing his specification as a whole. It is well to avoid repetition in a specification as far as possible, although a certain amount will be necessary, especially if the specification be divided into sections, as the work is divided into trades. Repetition in a specification is required under these conditions in order that the estimators will overlook nothing and in order that the workmen at the building will overlook no important features where the activities of various trades come together. The specification writer must realize the weaknesses that exist in the building industry as a whole. He must realize the rush which always develops during the estimating periods and must prepare his specification to overcome, as far as possible, the possibility of there being error due to complications and lack of clarity in the specifications. Clarity, then, is one of the most important qualities of good specification writing. Cut your cloth to fit the man. Exert yourself for clarity and simplicity. Specify exactly what you want. It is better not to say anything on a subject than to say too much and to say it indefinitely. Eliminate all unnecessary clauses. Say nothing that will suggest indecision in the slightest degree. Do not write anything that you know will not be enforced to the letter.

The reader may ask about the "or equal" clause. Many specification writers say, and try to make themselves believe, that the use of this clause is wrong. The great majority of writers, however, use it constantly. It is a good clause and proper, but be sure that the specifications define its meaning properly and clearly. Leave no doubt in the minds of any of the estimators as to what the meaning of the clause is and why it is used in the specification. It should mean that the architect is the sole judge of the "equality" of materials and that his approval is necessary in writing and his decision is final. The purpose of the "or equal" clause is to protect the owner from a "monopoly" price, or to allow an available material to be substituted at the architect's discretion for a material that could not be delivered at the proper time. Building conditions and requirements are changing constantly. Everyone connected with the building industry is endeavoring at all times to bring down the so-called high cost of building. At the same time, they are trying to build

better. The specification writer is supposed to be fully acquainted with all phases of the building problems and with the rapid changes in the industry. The use of a properly defined "or equal" clause comes to the rescue of a specification writer when criticism is directed against him by the owner who hears of some new material or method and learns that his architect is not fully acquainted with it. The use of this "or equal" clause brings to the architect's attention for the first time many of these new materials and methods. It is sometimes advisable to allow the general contractor, in preparing his proposal, to give alternate proposals for materials or methods which he may consider the equal of those which have been specified. Coming in an alternate proposal, these new materials are presented and can be investigated and given proper consideration after the bids have been submitted and when there is more time to reach a decision as to their value. The use of this much discussed clause allows the writing of a specification with a broadness not readily attainable without it, and if properly defined, "or equal" can work no harm.

Specifications are written primarily as an accurate guide in building. They are practically the only records of what is required in the nature of materials, methods and workmanship, and they are, therefore, of the greatest importance. To be sure, the estimators, the contractors and the workmen may seem to disregard the specifications to an unreasonable degree. This may be due largely to the fact that they are in many cases entirely too complicated and involved. It is best to use simple words that any workman can understand and to make the sentences just as short as possible. Technical language should be used only in its well known trade meaning. Always give directions; never make suggestions. Do not try to conceal obligations. State clearly and specifically the results you want to have accomplished and the methods that must be used to obtain these results.

A financial institution is very likely to consider its building project with its commercial aspects uppermost in the minds of the building committee. The building is erected primarily to provide quarters for the bank. It must meet the requirements of the particular institution at a cost the committee decides it can afford. The bank must guard, at all times, the interests of its stockholders and of its depositors. Today "service" is very much stressed in banking circles. We find the banks providing service unheard of a few years ago. The bank building should be considered a form of service for the bank's depositors. The success of the bank is very closely related to the success of the building architecturally, as well as being dependent on the quality of service which it can provide for its customers. The success of any banking institution is very intimately connected with the success of the community as a whole. The specification writer must take these things into account in the preparation of his specification. He

must be in close touch with all developments of the project from its inception to its completion. He must know intimately the vital requirements. He must see that the materials and equipment he specifies are the best to meet these requirements. He is responsible, in great measure, for the success or failure of the work, since a poor specification will seriously affect the bank, its service to its depositors, and its value to stockholders and community.

Standardization is of great assistance in specification writing, especially in bank work. Standards developed by constant use are undoubtedly of great value. The term "standardization" in architectural work is often frowned upon, as "too commercial." But, in writing specifications for bank buildings, we are writing specifications for institutions that *are* commercial. Standardization can be and has been used successfully. It is recognized by the American Institute of Architects and it has published certain standard documents that without question have been a great success and relieve the duties of the specification writer considerably. Various trades have successfully produced standard specification documents for their particular trades. These, too, have been of great assistance to the specification writer. Standardization in specification work should be considered simply as an aid to accuracy and clearness,—a method to assist the production of a good specification. Architects who use an old specification corrected and changed for a new piece of work are unthinkingly standardizing,—so why not standardize and take advantage of short cuts and the great saving of time made possible by this simple means?

Standardization must, however, be used with considerable care. It is a most harmful tool if used improperly. Unless carefully used, it leads to unnecessary repetition, and many times there is a possibility of contradiction. Standard sections of a specification, standard paragraphs and standard sentences may very readily be used to describe the various materials in any type of building and to describe the methods and quality of workmanship in any kind of a specification. They apply particularly well to the description of the materials and methods and workmanship for a bank building, and especially to the highly specialized features peculiar to a bank, such as counter screens, vaults, protective devices, equipment, etc. The cost of the completed structure must always be kept in mind in using various standards. It is probable that a series of standards may be evolved for such items as must be regulated by costs. In considering the vault requirements for a bank building, we realize that the cost of the vault may vary greatly. The prime measure of vault construction requirements is the rating established by the burglary insurance underwriters. They have fixed various classifications whereby the rate that the bank must pay for burglary insurance is determined. These rates vary greatly, depending upon the construction of the vault, its floors, walls and roof as well as the construction of the vault doors

and the equipment within the vault. It is also affected by the protective devices which may be installed. Like all measures of this type, they are based on minimum requirements. Institutions that keep only a few dollars and no securities in the vaults may not, when they consider the insurance rates, feel that it is worth while to meet even the minimum requirements. The larger institutions, on the other hand, which store collateral and securities and have safe deposit boxes for the use of their customers, will undoubtedly decide, because of the insurance rates, to more than meet the minimum requirements. Many banks, for one reason or another, may wish to exceed very greatly the minimum requirements. Many feel that such action is good advertising,—that they are providing the greatest degree of protection to their customers, thus improving the service.

It is possible, therefore, for the specification writer to have several different standards for vault construction, for vault doors and for vault equipment, and to use his judgment in regard to a particular project in the selection of the standard for vault work. In consultation with the bank's building committee it can be very readily determined upon before the specifications are written, in order that the institution will have the vault which will best suit its particular requirements. The use of standards will require constant checking because of constantly changing conditions and new technical developments. The subject of counter screen construction may be treated in a similar manner, and costs will naturally vary with the type of screen and the kind of material of which it is constructed. Perhaps the latest development in this field is the so-called "screenless" counter. Many bankers feel that this type does not offer their employees the proper amount of protection. The other extreme would be the so-called "bullet-proof" counter screen where "bullet-proof" materials, such as glass, wire and steel are used. There are various other types of counter screens which are probably more common than either of the two extremes mentioned here. These types vary considerably in cost, from the wood counter and counter screen, to that of marble or bronze in various combinations. The specification writer must have in mind the costs of the various types of counter screen. The architectural design affects the specifications for the counter screen to a much greater degree than the construction of the vaults. In considering the various protective devices, costs and insurance ratings must be thoroughly investigated before the specifications are written, since costs will mount in proportion to the protection required. There is the question of protecting the vault from attack from the outside during hours that the bank is open for business as well as during the hours that the bank is closed. There is the question of protecting the interior safe deposit boxes, storage vaults and security chests from attack at all times. There is also the possibility of a person's being locked in

the vault, and this must be considered by the specification writer.

Standards or no standards, a bank building project cannot be completely successful without the proper spirit of coöperation between all parties to the project. This includes the owner, the architect and his employes, the contractor, the various sub-contractors, and the workmen. The specifications should be permeated with this spirit of coöperation without which coördination between the trades cannot be obtained. Without proper coördination delays result, costs climb, and unsatisfactory workmanship and materials develop in spite of the most careful and rigid inspection by the architect, and trouble develops in all its "57 varieties." With coöperation, the resulting success can be enjoyed alike by owner, architect, builder, workmen and the community in general. It can then be said that the poor old specification writer has fulfilled his responsibility. He has written another good specification for a bank building.

For the convenience of specification writers there is included here an outline list of many details which a specification should include.

GENERAL CONDITIONS. Use Standard General Conditions of the Contract as published by the American Institute of Architects.

ADDITIONAL GENERAL CONDITIONS. There are generally some items of General Conditions in addition to those included in the American Institute of Architect's General Conditions of the Contract, such as definitions of the sections or divisions of the specification, of the "or equal" clause, surveys, checking, photographs, progress work, schedules, etc.

ADDENDA. Various addenda which may be written from time to time during the estimating period or during the construction of the building may be added at this point in the specification.

MISCELLANEOUS GENERAL CONDITIONS. This section would include various items which are of a general nature,—items which must be done by the general contractor for the general benefit of all of the various sub-contractors and trades which may be employed on the building, such as cleaning the building, removal of rubbish, layout of the work, cutting, patching and repairs, any special plan which the contractor is required to provide, watchmen's service, etc.

TEMPORARY WORK. This section would cover such items as may be of a temporary nature, but which will be required for the use of the various trades, and covers such subjects as storage bins, sheds, batterboards, bracing and shoring, centering, electric work, elevators, building enclosures, fences, etc., protection of adjacent structures, pumping, stairways, water supply, etc.

WRECKING OF EXISTING BUILDING. Permits; Insurance; Bonds; Public utility service; Inventory; Materials.

EXCAVATION. Description of probable soil conditions resulting from test pits, borings, etc. Unit prices for additional excavations, rock, etc.

FILLING AND GRADING. Back fill; Rough grading; Top soil; Excess materials; Planting beds; Sodding; Seeding.

LAND DRAINAGE. Dry wells; Cisterns; Dry drains.

PUBLIC UTILITY SERVICES. Permits; Locations; Rules and Regulations; Sanitary drains; Rain drain; Water supply; Electricity; Gas; Telephones.

CONCRETE WORK. Materials; Aggregates; Cement.

CONCRETE. Mixtures; Reinforcing; Bars; Piers; Cages; Mesh; Forms.

WORKMANSHIP. Approval; Freezing weather; Mixing; Openings; Bond; Cutting; Joints; Placing; Protection; Repair; Tests.

CONSTRUCTION. Areas; Bases; Bulkheads; Curbs; Expansion joints; Fences; Fireproofing; Floors; Floor construction; Floor fill; Under floor; Wearing surface; Hardener; Foundations; Forms; Gutters; Lintels; Partitions; Pits; Piers; Retaining walls; Footings; Facing; Roof construction; Sidewalks; Stairs; Tanks; Trenches; Walls; Vaults; Materials; Methods; Mixture; Care; Coöperation; Floors; Insulation; Openings; Reinforcing; Waterproofing.

MASON WORK. Materials; Workmanship; Brickwork; Materials; Common brick; Paving brick; Concrete brick; Enamel brick; Face brick; Fire brick; Hollow brick; Metal ties; Laying of common brick; Laying of face brick.

CUT STONE WORK. Materials; Granite; Limestone; Marble.

WORKMANSHIP. Carving; Cutting; Moulded work; Washes; Reveals and returns; Finish; Setting granite; Setting limestone; Setting marble; Cast stone; Hollow tile; Terra cotta.

WATERPROOFING AND DAMPPROOFING. Materials; Workmanship; Guarantee.

MARBLE, SLATE, TILE, TERRAZZO WORK. Materials; Samples; Marble; Slate; Tile; Terrazzo; Installation; Cleaning and polishing; Guarantee; Setting marble; Setting slate; Setting tile; Placing terrazzo.

STRUCTURAL STEEL. Use the Standard Specifications for Structural Steel as adopted by the American Institute of Steel Construction, in such degree of detail as may be required by the particular work.

MISCELLANEOUS IRONWORK. Materials; Workmanship; Measurements; Field work; Guarantee; Construction; Gratings; Coal bin chutes;

Ladders; Trench covers; Pit covers; Railings; Cleanout doors; Curb angles; Grilles.

BRONZE WORK. Materials; Workmanship; Construction; Hardware; Glass frames; Grilles and wickets; Vault grilles; Radiator grilles; Entrance doorway; Windows.

SHEET METALWORK. Materials; Workmanship.

ROOFING. Inspection; Guarantee; Materials; Slate; Tar and gravel; Workmanship.

FURRING AND LATHING. Materials; Workmanship; Construction; Ceilings; Beams and cornices; Chases, air ducts, etc.; Corner beads.

PLASTERING. Materials; Workmanship; Ornamental plastering.

CARPENTRY. Rough carpentry; Screens; Bucks; Ridge boards; Blocks; Plates; Anchors; Cornice work; Portico; Roof boarding; Nailing strips; Planking; Balconies; Slides; Scuttles; Stairs.

EXTERIOR FINISH WORK. Doors and frames; Window frames and sash; Columns, etc.

INTERIOR WOOD FINISH. Veneers and veneered work; Solid stock; Models; Junction strips; Base; Chair rail; Stools; Wire moulding; Architraves; Doors and door frames; Stairs; Counter screen; Wood partitions; Dado work; Mantels; Telephone booth; Cornices; Panels, etc.

FLOORING. Materials; Linoleum; Rubber tile; (see also Marble, Slate, Tile, Terrazzo work); Workmanship; Finish; Cleaning.

PAINTING. Samples; Materials; Workmanship; Exterior work; Interior work; Bank painting; Plumbing apparatus; Heating apparatus; Electrical apparatus; Signs.

GLASS AND GLAZING. Samples; Measurements; Guarantee; Protection; Materials; Distribution; Setting.

PLUMBING. Materials; Workmanship; Fixtures; Sanitary drainage system; Rain drainage system; Vent system; Cold water supply system; Hot water supply system.

HEATING. Materials; Workmanship; Temporary heat; Boilers, etc.; Tools; Piping; Valves; Hot water heating system; Vapor heating system; Steam heating system; Covering; Automatic control.

VENTILATION. Ducts; Fans; Equipment; Installation, etc.

ELECTRICAL WORK. Materials; Conduit and fittings; Wires and cables; Service switches; Switchboard; Entrance service; Test and guarantee; Workmanship; Outlets; Lighting system; Power system; Telephone system; Low tension system; Electric protective system; Electric lighting fixtures.

VAULTS, VAULT DOORS, VAULT EQUIPMENT AND SECURITY BOXES, ETC., require detailed specifications of a highly specialized character developed by the vault engineer in collaboration with the architect.

STRUCTURAL FRAMES OF BANKS

BY

H. G. BALCOM

CONSULTING ENGINEER

THE structural steel framing for bank buildings, which this article is intended to describe in a general way, offers as many or more varied problems of engineering than are found in almost any other class or type of building. In bank structures, as in the case of other buildings of a monumental type, the structural design is regulated by conditions which the architect has pre-determined,—that is, the general layout of the banking room, and the architectural effect of the exterior in many cases practically fix the conditions that the engineer, in laying out the framework, is bound to follow. The varied conditions of framing found in bank buildings are, of course, due to the varied types of bank buildings, from the small country bank, where only a banking room and bank working space are required, to the larger city banks, where generally the banking room is located in the lower floors of a tall building. The steel layout for the smaller type of bank buildings is illustrated in Types A and B, which the writer has taken the liberty of referring to as “country banks,” as they are generally found in the smaller cities and outlying communities. In the main, such a bank requires only a large banking room, one basement and a working mezzanine floor, and these banks are, of course, of extremely simple structural design. The columns in the basement story that support the banking room floor are generally laid out in the most economical way possible, and the clear span roof beams or trusses are generally located in the same way,—if not fixed otherwise by some considerations of the architectural design.

In buildings of Types A and B, columns in the exterior walls are sometimes used, but where the masonry construction is sufficient to take the roof loads, the roof girders or trusses rest directly on the walls with the proper bearing plates. The roofs of many of the smaller banks of this type throughout the country are carried on simple types of trusses. The air space between the hung ceiling and the roof of such a building serves as an insulating space against the hot sun, which might otherwise make the banking room unbearable in the summer.

Type A illustrates the framing of a bank one story high, in which it was not necessary to provide a skylight, since adequate daylight was admitted from the windows across the front and along one side. The roof is supported by simple steel girders from which the segmental plaster ceiling is hung. The bank of this kind is framed in the simplest way.

Type B illustrates a bank building similar to that of Type A, excepting that a skylight is used in the roof for light and ventilation where the building is located on an interior plot, and light and ventilation are not from the side windows as in Type A.

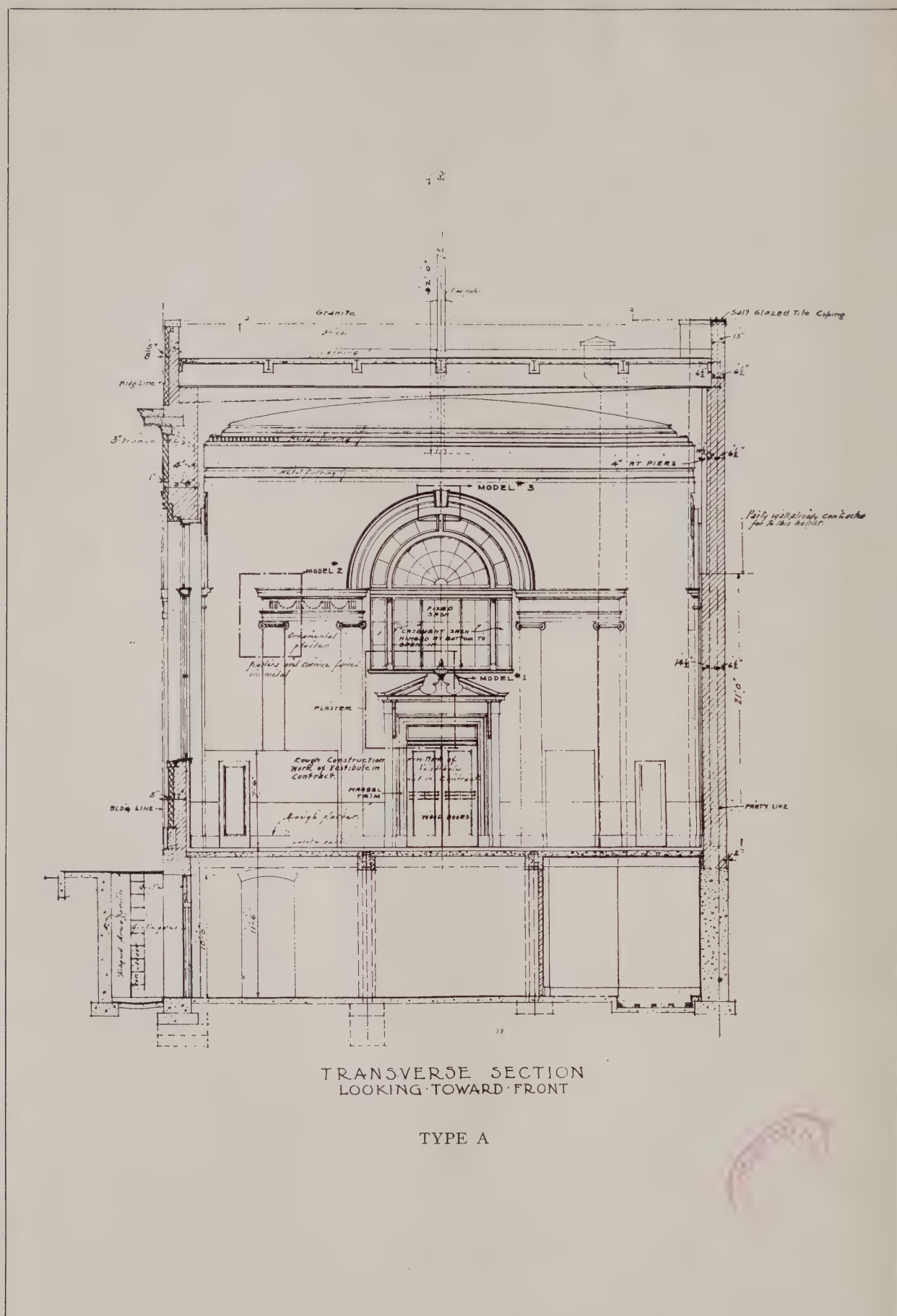
Type C illustrates the condition where the bank-

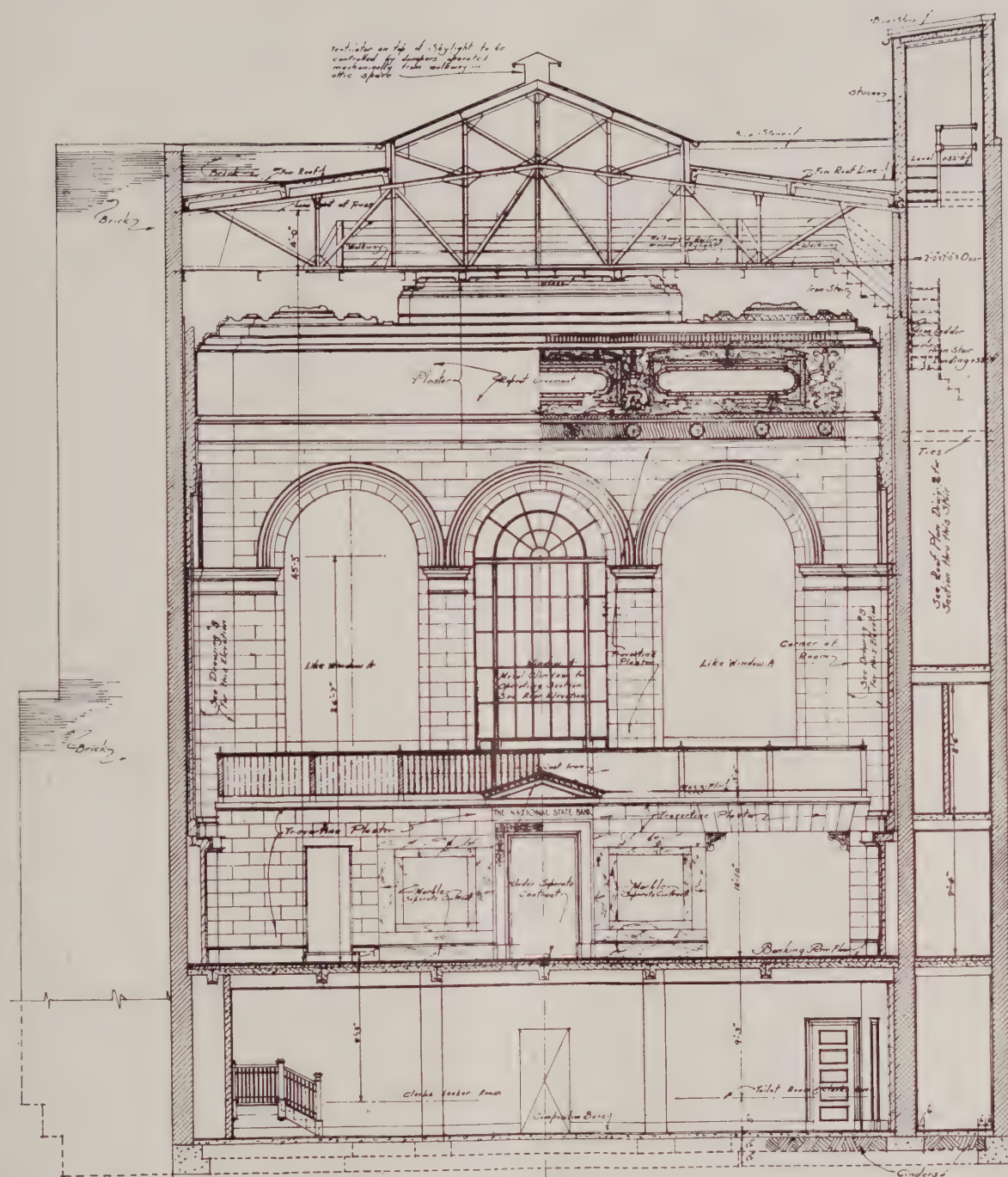
ing room is located in the lower stories of a tall building, and where it was possible to extend the columns of the office building through the banking room. While this is not often the case, the extending of the columns through the banking room naturally gives a more economical layout for steelwork than if building columns were carried on girders and trusses and the banking room free of columns.

A rather useful method of keeping a clear span banking room with a maximum of height and still supporting floors above, is illustrated in Type D. In this case the supporting steel girders are located in an upper story, and the floors above the banking room are supported on steel hangers. While this type of steel framing with suspended upper floors is more expensive than the usual type of framing, it does in many cases solve the architect's problem of getting area where it is most desirable and using the space for the steelwork in a less important part of the building. Both the fabrication and erection of steelwork on this type of framing are more costly than for ordinary steel-cage construction. A layout of this type may, without increasing the cost of the steelwork by any considerable amount, be extended to supporting two or three floors above the banking room, but if the structure is carried to a much greater height, cost of steelwork will be increased.

Type E illustrates about the maximum condition of heavy steel framing that is generally found in bank buildings. The two-story trusses shown in this illustration span a banking room approximately 80 feet wide, and in addition carry 14 or 16 office floors above. Trusses are generally used under these conditions, as they permit passageways between the members and make the space between the trusses available. Box girders were used to support the structure over the front and rear where the span was short enough to allow such construction. The large two-story trusses were used where the span was the maximum and many stories of office floors had to be supported. In the open court, one-story trusses were used, as there were no office floors to be supported. The flat roof of the court is placed at the lower chord of the truss and is provided with vault lights to admit light to the main banking room.

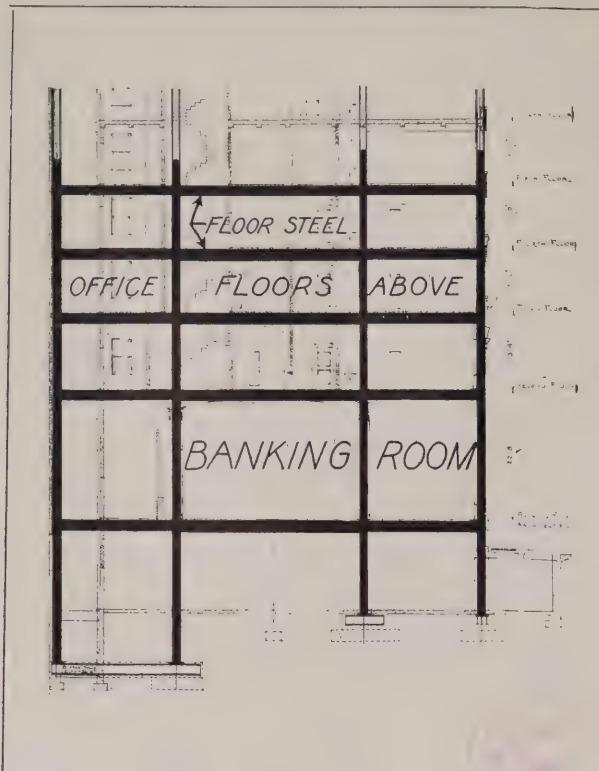
This article is written with the idea of indicating typical conditions only, since each individual building presents its own particular problems in the steel layout, just as it does in other particulars. One building, which the writer regrets that he was unable to illustrate, and which in his opinion was most interesting and unique, had an elliptically shaped banking room. This, of course, is an unusual form, and it involved many interesting features of steel construction. The typical problems are all that the writer has attempted to mention in this brief article.



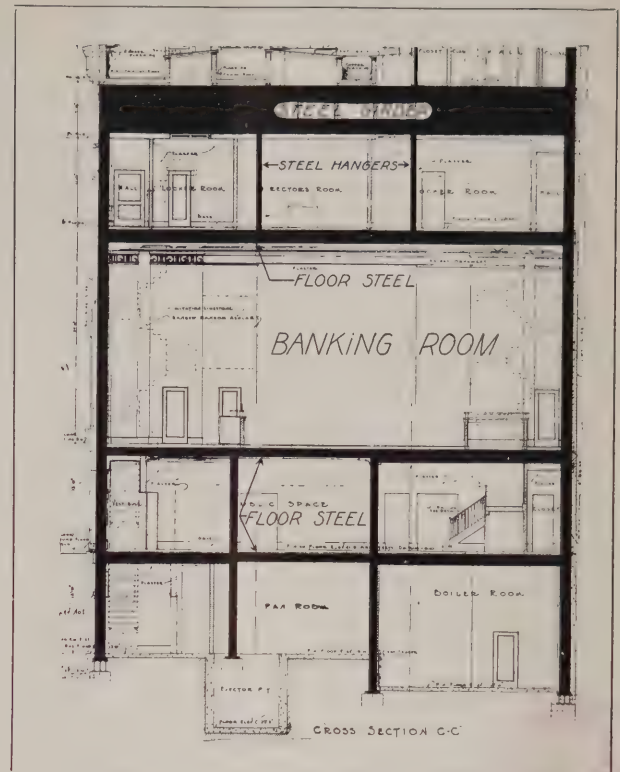


TRANSVERSE SECTION A-A

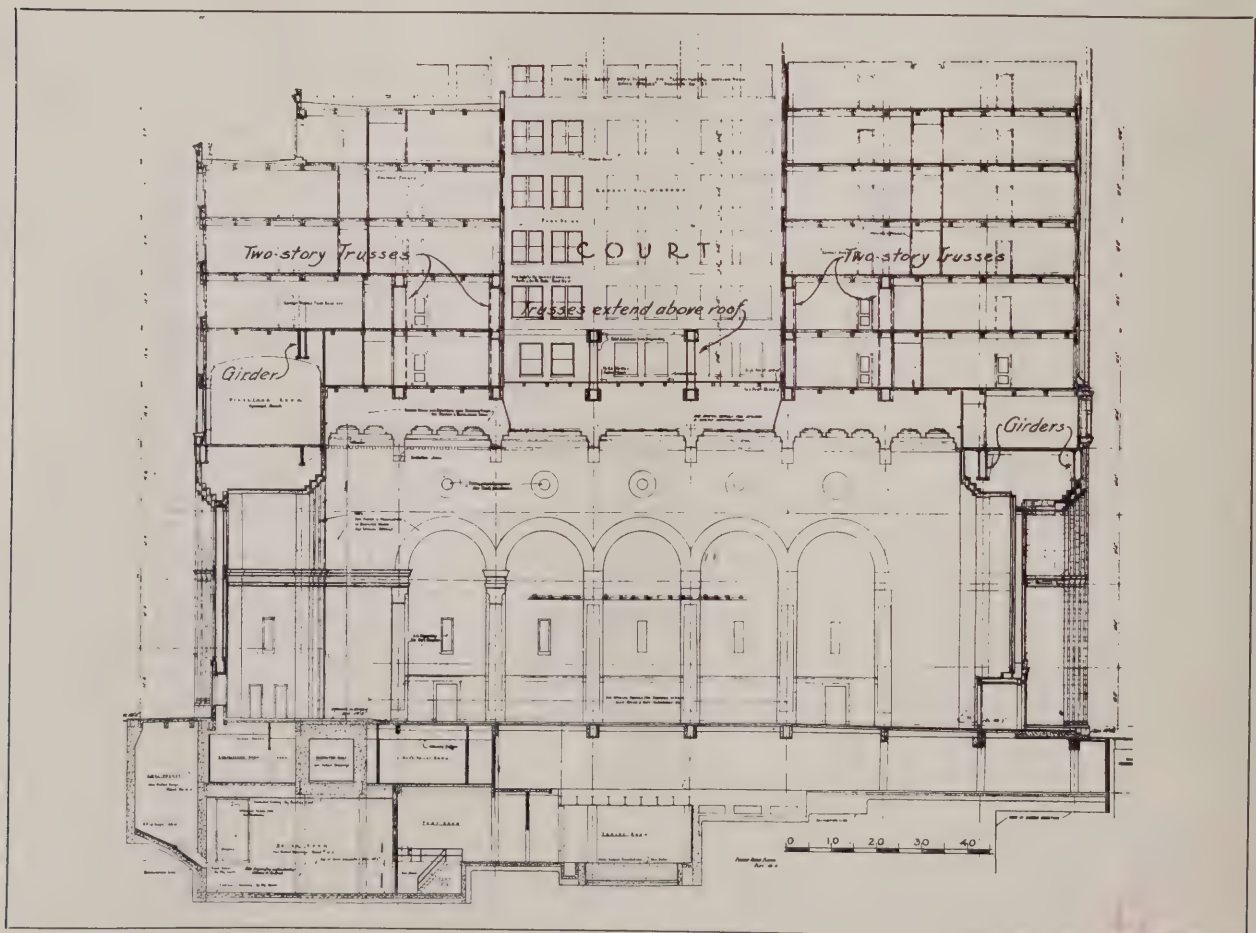
TYPE B



TYPE C



TYPE D



TYPE E

SUPERVISION OF BANK BUILDING CONSTRUCTION

BY

GARDNER C. COUGHLEN

OF WEARY & ALFORD COMPANY

THAT the solidity and permanence of a banking institution may be expressed in a manner befitting its standing in the community, the construction of the building should embody in every detail the ultimate in the economical use of the materials chosen and in the labor of erection and installation. The drawings and specifications will prescribe the quality of materials and labor desired, but the superintendent of construction, resident on the site, is the man responsible for securing the quality of all labor and, in many instances, the quality of material furnished at the building.

Supervision of building construction requires a high degree of intelligence, based on experience in both office and field, and an executive ability similar to that required of any army field general. Certain general rules of conduct may therefore be laid down for the guidance of construction supervision. A series of instructions concerning the superintendence of any kind of building construction should be predicated on the theory that they are supplementary to the drawings and specifications. Such instructions should be considered the philosophy governing the entire construction program and should therefore stress the major "do's" and "don'ts" which experience and good practice seem to dictate as reasonable for all concerned in the erection of the building.

Building construction for a bank should be considered from an angle somewhat other than building construction for an individual. Banks are generally strongholds of conservatism and caution, and yet they are desirous of obtaining the best of quality products at the lowest prices possible with quality the ruling desideratum. The members of a bank's building committee are usually men who have had experience with other building construction operations, either as members of school boards or other building committees or through the bank's mortgage department. The construction superintendent therefore will find it necessary to consider the experience of his building committee, so that harmonious relations will govern the whole proceeding.

The superintendent should be in complete charge of all field operations and public relations. Whatever the superintendent may do will establish a reputation, either good or bad, for his employers as well as for himself, and he must therefore, be exceptionally careful to be correct, positive, conservative and considerate in all dealings with the persons with whom he may come in contact. The superintendent must always keep in mind the fact that the architect has furnished him, to the best of his ability, with drawings and specifications in such condition that from the time construction work starts he must supply the "know how" that the documents cannot furnish. No decision respecting anything whatever

should be made without considering all facts bearing upon the question at issue, so as to arrive at the best decision the judgment of the superintendent makes possible. After making a decision known to others, it should not be changed unless there are given reasons for the change that are more logical than those on which the decision was based; a vacillating attitude destroys the superintendent's administrative control of the work.

In the construction of the building the owner has purchased something that must be delivered to him in accordance with all the contract documents. At the same time, each contractor has agreed to deliver a definite article to the owner and, therefore, the most serious duty the superintendent has to perform is to see that the spirit of every contract is executed in a manner equitable to both parties. The owner should not be expected to accept less than he has bought, and the contractor should not be expected to deliver more than he has sold. As every building contract requires a "give and take," equity between all parties concerned must be considered.

Directions to the superintendent should include those enumerated in these paragraphs.

A. As soon as possible, check all drawings and analyze the specifications, and either notify the head office of any discrepancies or list indefinite points for answer.

B. Check bench marks, property lines, and overhangs of adjoining buildings, and arrange for the establishment of one permanent bench mark reasonably close to the building, but not closer than 200 feet.

C. Examine all detail sheets and become familiar with their requirements.

D. Before establishing dimensions for constructing surrounding items that will be made from shop drawings, be sure that the shop drawings on file are the finally approved copies. Wherever any dimensions are in conflict with dimensions on the original scale drawings, follow those established by the shop drawings unless they appear to be illogical.

E. The superintendent must assume responsibility for the correctness of dimensions and for the worth of materials or workmanship furnished, so that the contract requirements are adhered to and the progress of the work made smooth for all concerned. Procrastination or lack of knowledge with respect to the necessity for rejection of faulty work and the consequent necessity for changes is condemned by the careful architect. Vigorous action with respect to such work should be taken immediately upon discovery. Faulty material should be discovered before it is incorporated in the building, and faulty work should be discovered promptly after it has been done.

F. As the person in control of construction, the

superintendent should endeavor to settle all questions himself, referring to the H.O. (home office) only such matters as should properly receive the attention of the H.O. before determination. Except in unusual cases, all questions that refer to matters shown on the drawings, mentioned in the specifications or covered by shop drawings or subsequent specific instructions from the H.O., should be answered by the superintendent. In all cases the superintendent should not forget that he is the man who is familiar with all conditions at the building, and in referring any matters to the H.O. for final determination he should be sure to explain all conditions that should be known by the H.O. before making the decision.

G. As soon as convenient, the superintendent should arrange a progress schedule, inform the various contractors of the dates tentatively fixed, and secure their reaction, after which he should prepare a final schedule and keep in constant touch with the contractors whose material must arrive within the ensuing four to six weeks. The superintendent should not depend on the H.O. to look after this detail, since whatever may be done by the H.O. on this item is supplementary to the superintendent's efforts.

Since the limitations placed on this article preclude a full discussion of all the construction work and the superintendent's responsibilities thereunder, only the matter of superintendence of several items of finish work in the banking rooms will be covered, it being assumed that the reader has some reasonably thorough familiarity with the general building construction supervision necessities.

H. *Ornamental and Miscellaneous Iron*

1. Have material delivered according to a prearranged schedule, in proper sequence, and as soon as other work is ready to receive it. See that all items to be built into concrete or brick are on the site in time.
2. See that stonework is not damaged when installing window and door frames.
3. When framing of any kind is to be set in basement or other spaces that require waterproofing, see that all anchor bolts are waterproofed into the concrete before such framing is set.
4. Check location of stairs carefully where marble and plasterwork join with such stair construction.
5. See that calking around all door and window frames or other openings is done correctly.
6. Be very careful that floor checks are set level, at the correct floor heights and centers.
7. Make sure that steel sash operate properly, and check at frequent intervals to see that no plaster, dust or other substances have gathered in the sash and frame contacts to cause springing or bending of the sash when closing them during construction operations.
8. Have framing for all openings and for counter screen delivered and set in time for work of the contractor setting partitions and so that the electrician can get in his work, and that later the marble contractor may start setting marble for screens and columns.
9. Check laying out of all openings and

screen center lines from the bench lines and marks originally established.

10. See that the screen framing is fastened with bolts to floor direct or to sleepers provided, and to columns and walls, being careful that the correct height is maintained and that framing is set in straight, plumb lines.
11. See that all finished work is well protected after erection, so it will not be damaged by workmen of other trades.
12. Check up to see if any finished doors or windows will have to be left out to allow vault doors to be moved in.

Make sure that:

13. Work is lined up and not allowed to sag in such places as in long, unsupported lengths of counter screen.
14. All field joints and miters are well fitted. In bronzework no filling materials are allowed. Shop joints are brazed and scarcely, if at all, perceptible.
15. Pilaster bases are evenly spaced at deal plates, and that joints between marble ledge and metal top screens, and between linoleum counter tops and top screen, are tight.
16. Joints where metal abuts wall or other surfaces are tight and neatly made.
17. Bronze doors are properly hung; that edges of doors line up with joints; that doors are not out of wind, and that floor clearance is proper.
18. Concealed screw fastening is used wherever possible; that all exposed screws are neatly fitted and that heads are not damaged.

When the erection is complete see that:

19. All screws are in place.
20. All movable parts operate properly, and that hardware is complete and in order.
21. All key work, and proper keying, have been carried out. All keys, properly tagged, are turned over to the superintendent who gives a receipt. These keys are given to the bank officials later, with keys for other work.
22. All work is well cleaned, scratches and abrasions removed, and finish left in its originally intended condition.
23. Exposed hardware and other items subject to handling are covered or otherwise protected.
24. All miscellaneous loose items, such as signs, officers' ledge sets, calendar cards, etc., are accounted for.
25. All small items likely to be stolen are stored in a safe place.
26. Proper bank officials are given thorough instructions as to the operation of any special equipment and methods of cleaning or otherwise keeping the work in first rate condition.

J. *Marble*

1. Install steel framing for counterwork first of all, so that the electrician may start on his work, since no tile backing of screens can be done until all electrical work is completed.
2. Be sure that all steel framing is set from bench center lines and mark, set straight and plumb, and anchored thoroughly to walls, columns and floor.
3. Start work on walls and screen as soon as plaster and tile contractor is out of the way.
4. Check up to see that all piping and conduit work is in before laying floors.
5. See that finished floor levels and other heights are taken from original bench marks, previously established.
- 6.

Wire anchors of any material other than that specified must not be allowed. 7. When large size marble tile are used for floors, the fill should be laid across the space first to within $\frac{3}{8}$ inch of underside of marble; then the tile should be wet and the setting mortar buttered over the entire surface, and tamped down to its right level. 8. Have all marble set for floors before the erection of radiator grilles or other ornamental work, so that proper fit of the latter may be made. 9. In spaces having marble base with cove and tile floors, have cove and base installed as soon as practicable, so that tile floor may be laid afterward. 10. Have all window stools and other horizontal or projecting marble, such as counters or corners, covered where necessary, as soon as installed, to prevent damage.

Make sure that:

11. Mechanics are not allowed to use ledges for work benches or to store material on. 12. Stair treads are protected with boards securely held in place. 13. Fitting against other material is properly done, and cutouts for floor hinges, etc., are well jointed. At single-acting floor hinges, the base should be notched out at the bottom to clear the knuckle on the hinge arm and to permit the door to open without breaking the base. 14. Slabs are matched as to color tone and as to figure if any, bearing in mind the character of the material. 15. Electrical and other outlets are correctly placed. When outlets occur in the base, they should be centered if at all possible. Misplaced outlets detract from the appearance of any work. 16. Wet plaster is not permitted to fall on marble.

When floors are laid see that:

17. Packing boxes, etc., are *carried* and not *dragged* over the floors, as deep scratches are often made in this manner. 18. Mechanics do not leave tobacco stains on floors, since they cannot be removed from some kinds of marble. 19. Oil from pipe cutting or other sources, including putty, is kept off floors and walls.

When marble setting is finished see that:

20. Joints are well pointed and in a plane. 21. Joints in moulded and flat work, if not in a plane, are rubbed down and the original finish restored. 22. All floors are properly rubbed, and that scratches, etc. are removed from treads, thresholds and other surfaces not polished. 23. All surfaces are thoroughly cleaned and left in finished condition. 24. Adequate protection is provided on surfaces that may be splashed by water thrown from the grinding and polishing machines.

K. Metal Cage Equipment

1. Cage equipment is sometimes of wood, in which case much of what is often written on cabinet work will apply. 2. Installation of metal cage equipment is generally started after adjoining work is fairly well completed.

During erection see that:

3. Work is well fitted, properly fastened together,

and solidly anchored in place, with all screws and nuts drawn up tight. 4. Cage posts and other upright supports are shimmed to concrete floor and do not rest on linoleum. Cage post feet, after floor covering has been laid, are to be solidly fastened to floor and post. 5. Electrical work is installed along with equipment, including all special electrical devices. 6. Abutments of counters and marble ledges are at the exact levels to allow for linoleum tops; distance from front of marble ledge to rear of counter is kept so that deal plate will have proper projection at front; counters are perfectly level so deal plate will have uniform projection above linoleum top. 7. All hardware is neatly fitted. 8. All cove or other shoe moulding is in place. 9. After erection is complete, this branch of the work requires very thorough checking on account of its intricate detail and many miscellaneous items.

See that:

10. All work is cleaned up, including insides of drawers, cupboards, etc., scratches or other abrasions and exposed screw heads are touched up with enamel, and that finish in general is placed in its originally intended condition. 11. Linoleum tops are clean and that any joints between linoleum and other materials are tight and well made. Note that in general linoleum is to be laid without joints in itself. Air bubbles under linoleum are not permitted. 12. All equipment operates properly. 13. Hardware is as specified, operates properly, keying is correct, and all keys work; keys are tagged and turned over; stack locks or other locking devices are adjusted and work properly. 14. Drawers, etc. work easily and shut tight. This refers also to cupboard doors, etc. 15. All drawer interiors are complete and as called for. Filing devices, shelves, loose trays, inksets, bulletin boards, stop-payment panels and other miscellaneous items are complete and accounted for. Drawers that are interchangeable are in the locations indicated. 16. Bank officials are properly instructed in care and upkeep of the work and in operation of any mechanical features.

L. Vault Work

This work is generally completed some time before opening, and mechanics are sent later to do the final cleaning. On completion it should be gone over and checked. It is well to suggest here that extreme accuracy be used, in setting the doors, as to levels and position so that architraves will connect properly with adjoining surfaces and doors will balance properly.

In checking, these items should have careful attention. See that:

1. Vault doors are properly balanced. A door that is balanced can be given a slight push when in any open position and it will come to rest in a short distance and remain there. If a door is not balanced, it will move of its own accord from several different open positions, provided, of course, that the hinges are not binding. 2. Time lock and combinations

function. The time lock should be tried out for several days to make sure it is all right. Bank officials should lock and unlock doors at this time so as to become familiar with them. 3. All keys for glass doors, time locks, safe deposit boxes, etc., are on hand and work their respective locks. Every safe deposit box key should be tried. All keys should be turned over to the proper bank official by the vault foreman and be receipted for. 4. Burglar alarm is entirely connected with vault equipment and in working order. Bank officials should be made thoroughly familiar with the care and operation of the protection system by the foreman. 5. Fans, light fixtures or other work of an electrical nature installed under the vault contract is complete and working. 6. Bond boxes are as specified, and that special sheet metal equipment for large boxes is as called for. Sometimes special sheet metal equipment is furnished and installed by others, in which case see that after this equipment is installed, locker doors, etc., close properly.

7. Painting is well done and as specified. This includes the interiors of lockers, safe deposit nests, bond boxes, exposed lining, etc. 8. All work is properly fitted, with especial reference to exposed finish joints. 9. All natural finished surfaces are in good and clean condition, free from abrasions, rust, etc., and they are given a heavy coat of protective grease, if not of stainless steel, before the foreman leaves. 10. All miscellaneous items, such as hinges, hardware, gates, grilles, footbridges, etc., are in place, and are as called for. 11. Proper bank officials are given thorough instruction by the vault foreman in care, upkeep and operation of all equipment. 12. Vault work generally comes from the factory coated with grease as a rust preventative. After this is removed, a heavy coat of grease or oil is applied until final cleaning. Once cleaned and in use, all polished surfaces should be cleaned weekly by means of a soft cloth and light oil. This leaves a clean surface coated with a thin film of oil, and if regularly and properly done, will keep the work in good condition at all times.

13. After the foreman leaves, and until the men return for the final cleaning, polished steel surfaces are regularly inspected for rust spots. Should rust spots develop, immediately coat them with grease, a supply of which should be left by vault foreman for this purpose. 14. Never allow an inexperienced man to try to remove rust from polished steel. This work is for an expert. 15. Under no conditions use salamanders near polished steel, whether they are coated with grease or not. The acid fumes given off in combustion will cause rust to appear in a few hours. After 24 hours this rust will be almost impossible to remove without ruining the work. 16. Keep mechanics and others not familiar with the equipment, especially doors, from fooling with it. Much damage, hard to repair, can be done by mechanics of other trades who are fascinated by mechanism and often want to "see how it works."

M. *Ceramic Tile and Terrazzo*

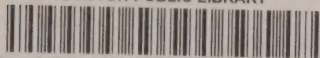
1. Make sure that all piping, conduit work and marble cove base is in before laying any tile floors.
2. Have brass mat frames set at time of laying marble floors.
3. See that a uniform joint is kept in floors and borders, and that it is laid to straight line.
4. Do not allow any blistered tile to remain in the floor; colors of tile must be uniform unless character of tile allows variation.
5. Floors must be level, and border on similar lines, straight and parallel. Easing off to square up rooms should be done in dark or otherwise obscure places.
6. If floor of some other material adjoins tile floor, see that the edge of tile is stopped against a perfectly straight board. Should there be a partition or screen covering such a joint, arrange to have the joint in center of the partition.
7. All joints must be grouted full, and afterwards the entire floor must be well cleaned.
8. See that no cement is left on floor after cleaning, as this will leave spots that are extremely hard to remove.
9. When setting tile wainscot, check the finished wall lines from the bench center lines, and the height of the wainscot above the finished floor from bench marks previously established.
10. The finished terrazzo floor must be well rubbed to produce an evenly polished surface.

N. *Miscellaneous Equipment*

1. Check carefully all schedules and requisitions covering miscellaneous equipment not included in other contracts. See that shipment of such material is made in time, and after checking, store in a safe place any items that are not fastened in place.
2. If fire extinguishers are ordered, have them put in work spaces, etc., where they are easily seen and accessible.
3. Toilet accessories fastened in place should be located so as to look well and at the same time be convenient.
4. Other miscellaneous items generally used are included in this list: Cuspidors and mats, inkwells, blotter pads and inksets, waste baskets, electric fans, rubber mats and the like.
5. Initial supplies of such items as toilet paper, paper towels, liquid soap, etc., are generally ordered, in which case see that they are turned over to the person who will have charge of them.
6. Electric lamps are not included in fixture contracts. As soon as it can be done, a schedule of proper sizes of lamps for different fixtures should be made up. If the bank has not already a lamp contract, it should make one with its dealer. Order an extra supply of each kind of lamp. Lamping up is usually done by the electrician who hangs the fixtures. See that all lamps light and that switching is correct. Turn extra lamps over to the bank.
7. Vault keys should be turned over to the bank direct by the vault foreman. All other keys are turned over to the superintendent. A few days before the opening, these keys should be turned over to the individual who is to have them in custody. See that all keys are uniformly tagged and hung in key cabinet in a systematic manner.

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